DETERMINANTS OF DIET QUALITY AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE AT ST. MARY'S MISSION HOSPITAL, NAIROBI COUNTY, KENYA

MERCY MOSOTI NYANGARESI

SHS/MPH/4087-2/2021

A THESIS SUBMITTED TO THE DEPARTMENT OF COMMUNITY HEALTH, SCHOOL OF PUBLIC HEALTH IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF PUBLIC HEALTH (PUBLIC HEALTH NUTRITION) AMREF INTERNATIONAL UNIVERSITY

JULY 2024

DECLARATION AND APPROVAL

Declaration by the Candidate:

I declare that this thesis is my original work and has not been submitted for publication or for any award in another university.

Signature: Date:……..

Mercy Nyangaresi

SHS/MPH/4087-2/2021

Approval by Supervisors:

This thesis has been submitted with our approval as university supervisors.

Signature: Date:……. 12/7/2024…….

Prof. Makokha Anselimo

Jomo Kenyatta University of Science and Technology

Signature: Date:……. 12/7/2024……

Dr. Florence Kyallo

Jomo Kenyatta University of Science and Technology

COPYRIGHT

DEDICATION

This thesis is dedicated to my beloved family. To my wonderful husband, Joshua Oyieyo, your unwavering support and encouragement have been my foundation throughout this journey. To my sons, Ian Orare and Einstein Buromu, my beautiful daughter, Michell Kwamboka, my niece Ruth and my nephew Samuel your love and motivation have fueled my determination to succeed.

A special dedication goes to my late mother. Your wisdom and inspiring words, "If you want something, go for it," have been my guiding light. Though you are not here to witness this achievement, your spirit and teachings have propelled me forward, enabling me to reach this significant milestone.

To all my friends, your cheers and support have been invaluable. I am deeply grateful for your encouragement and belief in me.

ACKNOWLEDGEMENT

I express deep gratitude to the Almighty for bestowing upon me the knowledge, wisdom, and resources necessary to successfully complete this degree.

I extend heartfelt appreciation to my esteemed supervisors, Prof. Anselimo Makokha and Dr. Florence Kyallo, for their invaluable guidance and wise counsel throughout my research journey. May their generosity of spirit be richly rewarded.

I am immensely thankful to my study participants and the management of St. Mary's Mission Hospital, particularly Dr. Fridah Bosire, the Medical Superintendent and Silvanus Wafula, the Hospital Administrator, for their unwavering support and collaboration. Without their participation, this accomplishment would not have been possible.

To my academic institution Amref international University, lecturers, and fellow students, I am indebted for your continuous encouragement and support, which provided a conducive environment for the completion of this work.

ABSTRACT

Background: Poor diet quality among pregnant women is a significant public health issue, contributing to adverse birth outcomes. Maternal diet is crucial for predicting maternal and child health. Nutrient deficiencies during pregnancy can cause irreversible damage to the fetus, increasing the risks of preterm delivery, low birth weight, impaired child growth, and maternal deaths during delivery. This study assessed the determinants of diet quality among pregnant women seeking antenatal services at St. Mary's Mission Hospital in Nairobi County.

Objectives: The study aimed to determine the quality of the diet, assess maternal characteristics, and establish nutritional literacy among pregnant mothers attending antenatal clinics. The relationships between these variables were also examined.

Methodology: The study utilized a descriptive cross-sectional design with consecutive sampling. Data were collected from 248 pregnant women using a questionnaire. Analysis was conducted using the Statistical Package for the Social Sciences (SPSS). The chi-square test was used at the bivariate level and multiple logistic regression at the multivariate level, with a significance level set at $P<0.05$

Results: The findings indicated that only 9.2% of the participants had good diet quality. Although there was adequate consumption of fruits, vegetables, and legumes, there was poor intake of calcium, iron, omega-3 fatty acids, and folate. Good nutrition literacy was observed in 62.1% of participants. Significant associations were found between diet quality and maternal characteristics, including employment status (AOR=2.845) and receiving health services during ANC visits (AOR=2.937). Fast food consumption was linked to poorer diet quality (AOR=0.821). Nutrition literacy was the strongest determinant of diet quality (AOR=3.79).

Conclusion and Recommendation: Pregnant women struggle to meet their nutritional needs, particularly for micronutrients. Employment improves economic status, enabling better diet quality through access to diverse food groups. Nutrition literacy is a significant predictor of meeting maternal nutritional needs. Therefore, enhancing nutrition literacy among pregnant mothers is essential for achieving good diet quality.

TABLE OF CONTENTS

DECLARATION AND APPROVAL I

COPYRIGHT II

DEDICATION III

ACKNOWLEDGEMENT IV

ABSTRACT V

TABLE OF CONTENTS VI

LIST OF TABLES XI

LIST OF FIGURES XII

LIST OF ABBREVIATIONS XIII

OPERATIONAL DEFINITION OF TERMS XV

CHAPTER ONE: INTRODUCTION 1

1.1 Background of the Study 1

1.2 Statement of the Problem 5

1.3 Research Questions 6

1.4 Objectives 7

1.4.1 Broad Objectives of the Study 7

1.4.2 Specific Objectives 7

1.5 Justification 8

1.6 Significance of the Study 9

1.7 Scope of the Study 9

1.8 Assumptions 10

CHAPTER TWO: LITERATURE REVIEW 11

2.1 Introduction 11

2.2 Maternal characteristics 11

2.2.1 Sociodemographic characteristics 11

2.3 Food Security 15

2.4 Lifestyle Factors 16

2.5 Nutrition Literacy 22

2.6 Diet Quality 24

2.7 Gaps in Literature 30

2.8 Conceptual Framework 30

CHAPTER THREE: METHODOLOGY 32

3.1 Introduction 32

3.2 Study Design 32

3.3 Study Site 32

3.4 Study population 33

3.4.1 Inclusion Criteria 33

3.4.2 Exclusion Criteria 33

3.5 Sample Size Calculation 34

3.6 Sampling procedures 34

3.7 Study instruments 35

3.7.1 Questionnaire 35

3.8 Pretesting 36

3.9 Validity of the instruments 36

3.10 Reliability of the Study 37

3.11 Data Collection Procedures 37

3.11.1 Training of Research Assistants 37

3.12 Data management and analysis 37

3.12.1 Social demographic characteristics. 38

3.12.2 Food Security 38

3.12.3 Physical Activity 38

3.12.4 Nutrition Literacy 39

3.12.5 Diet Quality 40

3.12.6 Statistical Analysis 43

3.13 Ethical Considerations 43

3.13.1 Approval 43

3.13.2 Confidentiality 43

3.13.3 Consent 44

3.13.4 Risks Associated with This Study 44

3.13.5 Benefits 44

3.13.6 Compensation 44

3.13.7 Withdrawal from The Study 45

3.13.8 Dissemination Plan 45
3.14 Study Limitations 45
CHAPTER FOUR: RESULTS 46
4.1 Introduction 46
4.2 Maternal Characteristics 46
4.2.1 Sociodemographic Characteristics 46
4.2.2 Obstetric and ANC Information 47
4.2.3 Lifestyle Factors 49
4.3 Food Security 55
4.3 Nutrition Literacy 58
4.3.1 Subscale I: Nutrition and Health 58
4.3.2 Subscale II: Energy Sources in Food 59
4.3.3 : Subscale III: Food Groups 60
4.3.4 Subscale IV: Consumer Skills 60
4.4 Measurement of Diet Quality 62
4.7 Association Between Diet Quality and Other Variables 65
CHAPTER FIVE: DISCUSSION 68
5.1 Introduction 68
5.2 Diet Quality among Pregnant Mothers 68
5.3 Maternal Characteristics as Determinants of Diet Quality 70
5.3.1 Sociodemographic Characteristics 70

5.3.2 Obstetric and ANC Factors 72

5.3.3 Food Security 73

5.3.4 Lifestyle Factors 75

5.4 Nutrition Literacy 78

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS 80

6.1 Conclusion 80

6.2 Recommendations 81

6. REFERENCES 82

APPENDICES 109

APPENDIX 1: QUESTIONNAIRES 109

APPENDIX 2: PARTICIPANT INFORMATION AND CONSENT FORM 116

APPENDIX 3: LETTER OF APROVAL FOR THE STUDY AREA 121

APPENDIX 4: NACOSTI RESEARCH LICENCE 122

APPENDIX 5: ESRC APPROVAL LETTER 123

APPENDIX 6; PLAGIARISM REPORT 124

LIST OF TABLES

Table 3.3.1: IQDAG Scoring Guide 42

Table 4.1: Sociodemographic Characteristics 47

Table 4.2: Respondents' Obstetric and ANC Information 48

Table 4.3: Services received during ANC Visits 49

Table 4.4: Vigorous Physical Activity 51

Table 4.5: Moderate Physical Activity 52

Table 4.6: Recreation and Leisure Time Physical Activity 53

Table 4.7: Time Spent Sitting 54

Table 4.8: Physical Activity Status 54

Table 4.9: Respondents' Alcohol Consumption 55

Table 4.10: Consumption of Home prepared food and fast foods 55

Table 4.11: Food Security Status 56

Table 4.12: Food Security Status 58

Table 4.13: Nutrition and Health Responses 58

Table 4.14: Energy Sources in Food Responses 59

Table 4.15: Food Groups Responses 60

Table 4.16: Consumer Skills Responses 61

Table 4.17: Nutrition Literacy Level 62

Table 4.18: Daily Intake of IQDAG components 63

Table 4.19: Consumption of IQDAG Components 64

Table 4.20: Respondents' Diet Quality 65

Table 4.21: Chi-square Bivariate Analysis of Determinants of Diet Quality 66

LIST OF FIGURES

Figure 2.1: Conceptual Framework..... 31

Figure 3.1: Study Location..... 33

Figure 3.2: Computation of MET-minutes/week 39

LIST OF ABBREVIATIONS

ANC	Antenatal Care
AMREF	African Medical and Research Foundation
ANOVA	Analysis of Variance
BMI	Body Mass Index
DASH	Dietary Approaches to Stopping Hypertension
DQI	Diet Quality Index
DQI-I	Diet Quality Index – International
ESRC	Ethics and Scientific Review Committee
FANTA	Food and Nutrition Technical Assistance
FAO	Food Agriculture Organization
GOK	Government of Kenya
HDI	Healthy Diet Indicator
HEI	Healthy Eating Index
HFIAS	Household Food Insecurity Access Scale
IPAQ	International physical activity questionnaire.
IQDAG	Diet Quality Index Adapted for Pregnant Women
KDHS	Kenya Demographic Health Survey
KHIS	Kenya Health information system
KNBS	Kenya National Bureau of Statistics

LMICs	Low- and Middle-Income Countries
MCH	Maternal and Child Health
MDDS-W	Minimum dietary diversity score for women
MDD-W	Minimum Dietary Diversity for Women
MET	Metabolic Equivalent of Task
MoH	Ministry of Health
MUAC	Mid Upper Arm Circumference
NACOSTI	National Commission for Science, Technology and Innovation
NLit	Nutrition Literacy Assessment Instrument.
UNICEF	United Nations International Children's Emergency Fund
PMTCT	Prevention of Mother To Child Transmission
PPAQ	Pregnancy Physical Activity Questionnaire
SMART	Standardized Measurement of Relief and Transition
SPSS	Statistical Package for the Social Sciences
WHO	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Diet Quality: A dietary metric that describes when a variety of essential nutrients and food groups has been consumed as prescribed in the diet guidelines.

Nutrition Literacy: The degree to which individuals have the capacity to obtain, process, and understand nutrition information and skills needed in order to make appropriate nutrition decisions.

Fast Foods: A type of processed food that is easily prepared in eateries as a quick meal to be taken away.

Processed Foods: Foods that have been subject to procedures that alter the foods from their natural state

Ultra-processed Foods: Formulations of ingredients derived from foods and additives, coupled with substances such as fat, sugar, salt, nutrients and additives including colorings, flavorings, sweeteners, and emulsifiers.

Home Cooked Meals: Food cooked at home from scratch or a recipe

Physical Activities: body activities that cause movement physically and are geared towards improving as well as maintaining the physical fitness of an individual

Lifestyle: The way of life of people in a certain region that includes the character people living in a certain area display when it come to the daily routine functions, the job they do, the activities they conduct even the food they eat and fun activities.

CHAPTER 1: INTRODUCTION

1.1 Background of the Study

Diet quality refers to the levels to which an individual's diet intake is healthy, based on adequacy, moderation, variety, and balance (Alkerwi, 2014). It reflects the ability to achieve ideal nutritional intake for the maintenance of good health and prevention of disease. Diet quality is critical during pregnancy as it plays a significant role in predicting birth outcomes. This is because, during pregnancy, the body undergoes several physical, chemical and biological changes to sustain fetal growth and prepare for labour and delivery (Soma et al., 2021). The changes are accompanied by an increased demand for energy and nutrients which is necessary to maintain optimal fetal growth and maintain the mother's nutritional status (Rolfers et al., 2020; Gernand et al., 2016). Increased nutritional demands necessitate the consumption of an adequate, varied and balanced diet. Such diets are necessary to ensure that mothers experience a healthy pregnancy and prevent preterm birth, low birth weight, and complications during and after delivery (Victora et al., 2019; United Nations, 2017).

The World Health Organization (WHO) recommends dietary diversification to address the macro and micronutrient deficiencies. This is based on the different food groups that need to be consumed over a period of time (WHO, 2018). A diet that provides adequate energy, proteins, minerals, vitamins and essential fats is key for women during pregnancy. The consumption of five or more food groups is majorly considered as a proxy for a good quality diet during pregnancy (Kennedy et al., 2021; FAO, 2019). Adequate macronutrient intake is necessary to meet increased maternal metabolic needs and fetal demands and prepare for delivery and lactation (Mousa et al., 2019). Specific micronutrients such as iron, calcium, folate, and iodine are key during pregnancy.

Nutrients such as zinc, iodine, iron and folic acid are especially critical in pregnancy for the prevention of cretinism, low birth weight and preterm births (Gernand et al., 2016). Adequate vitamin A is required to support foetal tissue growth and maintenance, B complex vitamins are required to support metabolism while calcium is needed to maintain bone density and support foetal bone development (Mousa et al., 2019).

Despite the significance of adequate nutrient intake in pregnancy, nutrient deficiency continues to persist in many low and middle-income countries (LMICs), especially in Africa. The diet consumed in these regions is majorly cereal-based and has little or no nutrient density from various sources like animal, vegetables or fruits (WHO, 2018). Women in LMICs are often unable to meet their dietary requirements while some come into pregnancy already malnourished (Gernand et al., 2016). Coupled with inadequate diets, prior malnutrition exacerbates the consequences of nutrient deficiencies. An estimated 15% of pregnant women in LMICs have vitamin A deficiency (Gernand et al., 2016). A study conducted in four LMICs in Asia, South America and Africa found that over 80% of the population did not meet their requirements for folate, vitamin B12 and choline, with 20-70% of them failing to meet dietary diversity requirements (Lander et al., 2019).

Studies in Kenya have demonstrated that pregnant women's nutrient intakes are inadequate to meet their nutrient requirements. The 2011 Kenya Micronutrient Survey reported that micronutrient deficiency among pregnant women was high, with iron deficiency prevalence being 36.1%, vitamin A deficiency at 5.4%, zinc deficiency at 68.3%, and folate at 32.1% (KNBS, 2013). According to the 2022 Kenya Demographic Health Survey (KDHS) (KNBS & ICF. 2023), 18% of women aged 15-19 and 7% of women aged 20-49 were thin or undernourished (BMI <18.5 kg/m^2). The same survey

found that 13% of adolescent girls (15-19 years old) and 45% of women aged 20-49 years were either overweight or obese (BMI ≥25-<30 kg/m^2). In Uasin Gishu, pregnant women choose not to consume high-biological value proteins and high-energy foods due to their association with local food and health beliefs (Broerse & Nangulu, 2017). Inadequate diets have been observed among pregnant women in Kisii County, where only 24% reported consuming animal-source foods and 25% reported consuming fruits (Obwocha et al., 2016).

Lack of micronutrients in diets of Sub-Saharan Africa such as vitamin B12, and zinc among others, makes women more vulnerable to pregnancy risks and even during lactation (Ali et al., 2020). An evaluation of national studies across Kenya, Nigeria, Ethiopia and South Africa revealed that iron deficiency anaemia, vitamin A, folate and zinc deficiency are prevalent among pregnant women Harika et al. (2017). According to this multicountry study, 47% of the national population of pregnant women in Nigeria are iron deficient, 47% in Nigeria have vitamin A deficiency, 70% in Kenya are zinc deficient and 12% in Ethiopia suffer from folate deficiency. Due to these inadequacies, many women are affected, translating to impaired foetal development and many risks during pregnancy such as low birth weight, premature deliveries and infant mortality (McLean et al., 2017; Gernand et al., 2019). Nutrient deficiency among pregnant mothers has been shown to affect maternal weight gain, infant birth weight and development of the foetus's central nervous system (Darnton-Hill & Mkparu, 2015). Iron deficiency anaemia during pregnancy increases the risk of maternal mortality during childbirth as well as impaired foetal development, which threatens cognitive development in the offspring's childhood (Kothari et al., 2014). On the flip side, consumption of high-quality diets improves weight gain during pregnancy, ensuring

optimal fetal growth and reducing risks during pregnancy and delivery (Kubota et al., 2013; Shin et al., 2019).

Inadequate dietary intake and poor lifestyle practices lead to poor nutrition status (Black et al., 2013). Since undernutrition is associated with inadequate dietary intake, to pregnant women, the diet quality becomes a critical component in determining their nutritional status. Studies have reported various factors associated with diet quality in the general population (De Assumpção et al., 2016; McCullough et al., 2022). Sociodemographic factors of women, including age, education level, and income, have been observed to influence their ability to consume quality diets (Dunneram & Jeewon, 2013; Akter et al., 2021). Similarly, older and more educated pregnant women with high incomes are able and highly likely to consume quality diets (Shamim et al., 2016). This is also true for both pregnant and non-pregnant women in food-secure households (Moafi et al., 2018; Singh et al. 2020).

While this evidence demonstrates the role of sociodemographic variables in predicting diet quality, this has not been sufficiently explored among the Kenyan pregnant women population. Further, there is a need to explore other aspects including lifestyle characteristics and nutrition literacy, to determine whether they play any role in predicting the diet quality of this vulnerable population. Despite the need to have a quality diet that is adequate for all pregnant women in Kenya, there are still limitations in existing data. Therefore, this study aims to assess the determinants of diet quality among pregnant women attending ANC at St Mary's Mission Hospital, Nairobi County, Kenya.

1.2 Statement of the Problem

Maternal malnutrition remains a significant health problem globally with prevalence of undernutrition at 9.1%, overweight at 32.5%, and anaemia at 32.8%. African countries, including East and West Africa, report a high prevalence of maternal malnutrition. In a systematic review of 23 studies that used both BMI and MUAC as indicators, Desyibelew, and Dadi (2019) found that the prevalence of maternal undernutrition in Africa was 23.5%. Researchers have established that undernutrition among pregnant women is also high in Kenya. A study conducted at Pumwani hospital reported a prevalence of undernutrition of 27% (Okube et al., 2022), while another in Laikipia reported a prevalence of 19% based on MUAC measurements (Kiboi et al., 2016).

This population is also highly affected by micronutrient deficiencies such as folate, calcium, zinc, vitamin A, and iron. In studies investigating micronutrient intake, researchers found that the diets of pregnant women in Kenya are deficient in calcium, folate, zinc, and vitamin A. (Othoo et al., 2014; Obwocha et al., 2016; Kiboi et al., 2016). Based on the results of biochemical assessments of micronutrient status, Mitheko et al. (2015) reported an iron deficiency of 16% based on haemoglobin levels. Inadequacy of micronutrients in diets during pregnancy contributes to this high burden of undernutrition (Desyibelew & Dadi, 2019). This is because both macro- and micronutrient needs increase during pregnancy, as more nutrients are needed to support both the mother and the foetus (Rifas et al., 2020). In Kenya's Nairobi county, there is a high carbohydrate and fat intake accompanied by a low fibre and micronutrient intake during pregnancy. The latest County Standardized Monitoring and Assessment of Relief and Transitions (SMART) survey indicates that while most Nairobi women

(97%) have a high starch consumption, their intake of micronutrient-rich foods is still low (GOK & Nairobi City County, 2020).

Nutrition inadequacies in pregnant women can have critical consequences on the lives and wellbeing of women and their children. Malnutrition during pregnancy is detrimental to foetal development and can result in life threatening complications during pregnancy and childbirth as well as poor cognitive development that affects a child's survival after birth, and growth and development in early childhood (UNICEF, 2023). In addition to causing to poor pregnancy outcomes, poor diet quality in pregnancy could lead to a deterioration the mother's nutritional status (Octavia et al., 2020). Moreover, children born of undernourished mothers could suffer irreversible nutrition deficiencies that may be passed down through generations. The quality of diets consumed significantly contributes to nutrition status. A quality diet among pregnant women is critical to improving the women's nutritional status and identifying the determinants of this is critical. While there are studies that provide data on the poor food consumption patterns observed among pregnant mothers, limited information exists regarding diet quality and its determining factors in this population. Therefore, this study intended to enhance the understanding of factors influencing diet quality among pregnant women attending antenatal care at St. Mary's Mission Hospital in Nairobi County.

1.3 Research Questions

i. What are the maternal characteristics of the pregnant women attending antenatal care at St. Mary's Mission Hospital in Nairobi County?

ii. What is the food security status of pregnant women attending antenatal care at St. Mary's Mission Hospital in Nairobi County?

iii. What is the nutrition literacy of the pregnant women attending antenatal care at St. Mary's Mission Hospital in Nairobi County?

iv. What is the diet quality of pregnant women attending antenatal care at St. Mary`s Mission Hospital?

v. What is the association between nutrition literacy, maternal characteristics, food security and diet quality among pregnant women attending antenatal care at St. Mary's Mission Hospital in Nairobi County?

1.4 Research Objectives

1.4.1 Broad Objectives of the Study

The broad objective of this study was to assess the determinants of diet quality among pregnant women attending ANC at St. Mary's Mission Hospital, Nairobi County, Kenya.

1.4.2 Specific Objectives

i. To assess the maternal characteristics of pregnant women attending antenatal care at St. Mary's Mission Hospital in Nairobi County.

ii. To evaluate the food security status of pregnant women attending antenatal care at St. Mary's Mission Hospital in Nairobi County.

iii. To determine the nutrition literacy of pregnant women attending antenatal care at St. Mary's Mission Hospital in Nairobi County.

iv. To determine the diet quality of pregnant women attending antenatal care at St. Mary's Mission Hospital.

v. To determine the association between maternal characteristics, food security, nutrition literacy, and diet quality of pregnant women attending antenatal care at St. Mary's Mission Hospital in Nairobi County.

1.5 Justification of the Study

While there are studies that provide data on the poor food consumption patterns observed among pregnant mothers, limited information exists on their diet quality also its determining factors in this population. In addition to contributing to poor pregnancy outcomes, poor diet quality in pregnancy could deteriorate the mother's nutritional status (Octavia et al., 2020). A quality diet among pregnant women is critical to improving the women's nutritional status and identifying the determinants of this is critical. Therefore, this study intended to enhance the understanding of factors influencing diet quality among pregnant women attending antenatal care at St. Mary's Mission Hospital in Nairobi County.

Researchers recommend that nutrition interventions be nutrition-specific and nutrition-sensitive to make an impact (Salam et al., 2015). To do this, identifying both immediate and underlying determinants of undernutrition is key. Identifying determinants of diet quality is essential to improving maternal nutrition. What pregnant women eat has a direct effect on the unborn child. Therefore, the women must have adequate and accurate information from health workers on food and nutrition during the prenatal stages.

Targeted anticipatory guidance is critical to addressing the issue of a diet quality among pregnant women. The study, therefore, sought to establish determinants of diet quality among pregnant women attending antenatal care. The results will provide a basis for gauging progress towards improving nutritional status among women and achieving

national goals including scaling up maternal nutrition as envisaged in Kenya's Nutrition Action Plan (MOH, 2018). Additionally, the results will provide important data for formulating relevant and evidence-based interventions to improve diet quality among women of reproductive age in Nairobi County, Kenya.

1.6 Significance of the Study

The study will provide profitable and practical insights about the determinants of diet quality among pregnant women attending antenatal care at St. Mary's Mission Hospital Nairobi County The findings have the potential to improve dietary patterns of pregnant mothers by informing on the deficits in their diets. This information will be used by health workers to inform targeted nutrition interventions among pregnant women towards improving diet quality at the hospital, community and individual levels, including nutrition education and counselling. The information obtained will be also fundamental in driving the policy guidelines and programming of interventions that will be aimed at guiding diet quality among pregnant women. Nairobi County and National government may utilize the information for the basis of planning, advocacy and delivery of targeted health education services to the pregnant women. Moreover, evidence for referencing, documentation and further research will be a major contribution of this study.

1.7 Scope of the Study

The study aimed at to investigating the determinants of diet quality among pregnant women attending antenatal clinic. It recruited 248 respondents visiting the St. Mary's Mission Hospital antenatal clinic over a period of two weeks. Factors explored as determinants of diet quality include maternal characteristics, food security, lifestyle factors, and nutrition literacy. Maternal characteristics studied include

sociodemographic characteristics like age, marital status, education, level and employment status; and obstetric characteristics such as parity, pregnancy stage, and clinic attendance behavior. Food security and lifestyle factors including physical activity, alcohol intake, consumption of homemade food and fast foods were investigated as maternal characteristics.

1.8 Assumptions of the Study

The researcher assumed that the instrument used would elicit reliable responses, that the respondents would fully understand the questions asked, and that the respondents would provide honest expressions on diet quality and factors examined.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter discusses evidence relating to the determinants of diet quality in pregnancy. The determinants reviewed in developing this literature review include maternal characteristics and nutrition literacy, and each determinant is discussed in line with its relation to diet quality. The review also discusses available evidence on diet quality. Sociodemographic characteristics and lifestyle factors are the maternal characteristics discussed while nutrition knowledge and skills constitute components of nutrition literacy covered in this review. It discusses quantitative studies that apply longitudinal and cross-sectional methodologies as well as clinical trials, empirical reviews, and meta-analyses. Studies were selected based on their coverage of both maternal characteristics and nutrition literacy components.

2.2 Maternal characteristics

2.3 Socio-Demographic Characteristics

Disparities in sociodemographic characteristics place individuals in different positions in obtaining healthy diets. Researchers have found that these differences make some populations more vulnerable to diet inadequacy than others. This impact of sociodemographic variables on nutritional adequacy affects populations in both developing and developed countries. In a Brazilian cross-sectional study involving 3,382 participants, it was reported that age and education levels affect dietary patterns among adolescents and adults (De Assumpção et al., 2016). The findings revealed that with increasing age and education, there is a corresponding increase in the consumption of whole grains, vitamin A-rich vegetables, total fruits, vegetables, and essential oils.

According to the data, people's sodium intake increases as they age and achieve better education (De Assumpção et al., 2016).

In relevance to these findings, higher education levels could imply better nutrition knowledge that is evident in individual dietary patterns. However, it is evident that excessive sodium intake, associated with hypertension development, is a pertinent threat to health. Data from US populations show similar trends. In a recently published large nationwide cohort study, McCullough et al. (2022) found that income, ethnicity, geographical location, and education play a huge role in predicting nutrition behavior. Their findings showed that while some ethnic groups are more prone to poor diet quality than others, with associations of education and income affecting the quality of dietary intake. Additionally, the results reported a higher likelihood of poor diet quality among rural residents.

However, urbanization affects the availability of healthy diets and the affordability of the available healthy foods. In the study, higher education attainment reduced the risk for poor diet quality. Still, people living in metropolitan areas were at a higher risk of poor diet quality regardless of their education level (McCullough et al., 2022). While these demographic factors affect both men and women, generally women are reported to have better diet quality than men (Kang et al., 2020; De Assumpção et al., 2016; McCullough et al., 2022). Studies conducted among women stipulate that age and education predict diet quality. In a study done among Mauritians, Dunneram and Jeewon (2013) found that poor diet quality was prevalent among younger women regardless of education level or employment status. The same study reported that higher education and well-paying jobs moderate diet quality among middle-aged women. This evidence may suggest that the dynamics of the influence of sociodemographic factors

on diet may be complicated. Women of reproductive age with low income and education are at a higher risk of poor diet quality. According to Akter et al. (2021), the better life provided by high educational attainment and the associated high income and the stability of married life increases the likelihood of achieving high diet quality.

The influence of sociodemographic characteristics on diet quality is no different among pregnant women. In line with a study by Shamim et al. (2016), older pregnant women with higher education levels and high household income have better access to a variety of diets, making them highly likely to meet their dietary needs. The same study reports that the consumption of protein-rich foods is associated with high socioeconomic status since these foods are expensive. Diets in most developing countries are predominantly starchy, and starchy staples are easily accessible and affordable to most women. As such, researchers consistently observe that women from low socioeconomic households are unable to achieve recommended intakes of meats, eggs, and dairy (Shamim et al., 2016; Gokhale & Shobha, 2022). However, urbanization interferes with this dynamic. In urban areas, protein-rich foods such as chicken, eggs, and milk are easily available.

Studies in Kenya have shown that limited dietary diversity is a common issue among pregnant women, especially those from low socioeconomic backgrounds. For instance, a study conducted in Nakuru County found that 60% of pregnant women from low socioeconomic backgrounds had inadequate dietary diversity, with a high reliance on starchy foods and minimal consumption of fruits, vegetables, and protein-rich foods (Wanjiru et al., 2018). Additionally, a study in Kakamega County indicated that low-income pregnant women were more likely to have inadequate intakes of essential micronutrients, with 68% reporting low consumption of iron-rich foods and 64% having low intake of vitamin A (Omondi et al., 2019).

Parity, gestational age, marital status, and clinic attendance are important maternal characteristics influencing diet quality during pregnancy. Parity refers to the number of times a woman has given birth. Studies indicate that multiparous women (those who have given birth more than once) may have different nutritional needs and dietary patterns compared to primiparous women (those who are pregnant for the first time). According to a study by Lindsay et al. (2017), multiparous women often have better diet quality due to accumulated knowledge and experience in managing pregnancy-related dietary requirements.

Gestational age, or the stage of pregnancy, also plays a role in dietary intake. Research has shown that diet quality tends to improve as pregnancy progresses, possibly due to increased health consciousness and prenatal care advice (Fowles et al., 2012). However, in some cases, dietary restrictions and food aversions in early pregnancy may negatively impact diet quality. Marital status is another factor affecting diet quality. Married women generally have better diet quality compared to single women, which could be attributed to increased social and financial support from partners (Hossain et al., 2020). This support often translates to better access to diverse and nutritious foods.

Clinic attendance, particularly regular prenatal visits, significantly influences diet quality. Prenatal clinics provide nutritional counseling and supplementation, which are crucial for maintaining a healthy diet during pregnancy. A study conducted in rural Kenya found that women who attended prenatal clinics regularly had significantly better diet quality and nutritional status compared to those with irregular clinic visits (Kiboi et al., 2016).

2.4 Food Security

While urban areas have more varied food options available, socioeconomic differences among urban residents influence their food security status by curtailing access to these options. Additionally, urban areas have increased access to unhealthy food options, placing individuals living there at an increased risk and chances of having poor diets of low quality, regardless of socioeconomic status (McCullough et al., 2022). Another study found that poor people especially those residing in urban areas have limited access to healthy foods, which are more expensive in poor urban neighborhoods (Vilar-Compte et al., 2021). In addition, the review reports that some of these neighborhoods may not have healthy options, necessitating travel costs, which women of low socioeconomic status may be unable to afford. Despite the advantage of the healthy foods available in urban areas, access to these options differs for women of varied sociodemographic groups.

Further, the food security status of pregnant women is a determining factor in their health and nutrition status. In a recent Iranian study, researchers found that food insecurity affects a significant number of women (Moafi et al., 2018). The same study reported that food-insecure pregnant mothers cannot achieve the expected quality of life, citing the impact on their quality of diets. Food insecure women may not have the option to choose foods to eat, since access and affordability take away the freedom to do so. Moreover, the availability of social support for women contributes to the achievement of long-term food security, as observed by researchers in Kenya (Nagata et al., 2015). As observed by Singh et al. (2020), food security status determines the quality of diets consumed by mothers. At the same time, sociodemographic characteristics are significant in predicting a household's food security status among

pregnant women (Bukari et al., 2021). For pregnant women, household food security does have a pertinent role in determining the nature of diets consumed.

2.5 Lifestyle Factors

Lifestyle is defined as the way of life of people in a certain region that includes "the character people living in a certain area display when it comes to the daily routine functions, the job they do, the activities they conduct even the food they eat and fun activities" (Farhud, 2015). Lifestyle includes what people choose to eat, where they frequently obtain their food, and the activities they frequently engage in. Therefore, dietary and living patterns form part of people's lifestyle. An unhealthy lifestyle is a threat to both physical and mental health. This study will dwell on the consumption of processed foods, home-cooked meals, alcohol, and physical activity as lifestyle factors of concern regarding the diet quality of pregnant women.

2.5.1.1 Consumption of Processed Foods.

Consumption of highly processed convenience foods is high in urban areas where these foods are universally available. Highly processed and unhealthy food consumption with excessive amounts of sugar, trans-fats, and saturated fats increases the likelihood of suffering from chronic diseases (Farhud, 2015). For pregnant women, this could increase the risk of developing gestational diabetes and preeclampsia. According to Fuhrman (2018), the effect of consuming fast and processed foods goes beyond the development of diabetes, hypertension and cardiovascular disease. The author posits that these foods contribute to the destruction of brain cells, which may lead to mental illnesses and reduced intelligence. As such, there is a need for individuals to watch their food choices.

Studies have indicated that indulging in these fast foods is correlated with poor diet quality. An Australian cross-sectional study found that individuals consuming excessive amounts of processed foods score poorly in diet quality scores (Marchese et al., 2021). The study reported that participants with low diet quality scores exhibited high-energy intakes from highly processed foods, including instant foods, fast foods, confectionery, and mass-produced bread. Reduction in trans-fat and saturated fat-containing foods influences diet quality. Processed and fast foods contain excessive amounts of sugar, sodium, saturated fats, and trans-fats, and when they make up most of a person's diet, their diet quality is affected. In line with a recent meta-analysis, high consumption of ultra-processed foods is correlated with reduced protein, micronutrients, and fiber consumption (Martini et al., 2021). The study findings reveal that in areas where fast foods constitute the majority of the diet, the intake of the micronutrients magnesium, zinc, potassium, vitamins A, C, D, E, B3, and B12 is reduced.

Other studies report contrasting findings. For instance, a 12-year cohort study observed that trans-fat and saturated fat intake trends keep increasing (Park et al., 2020). Despite this dangerous diet component increase, the study observed a slight overall increase in diet quality among the study population. This could be because the increase in fat intake was too small to elicit any negative change in the overall diet quality score. Another study, which reviewed available literature, concluded that diet quality does not mediate the causal relationship between processed foods and chronic disease risk (Dicken et al., 2021). While acknowledging the influence of processed food intake on diet quality, the authors assert that changes in diet quality do not alter the likelihood of poor health outcomes related to the consumption of processed foods. Nevertheless, the evidence supporting the role of high consumption of ultra-processed foods on diet quality is

overwhelming. In addition to previously discussed studies, Liu et al. (2022) provide further evidence of the association between diet quality and processed food consumption. According to the findings, the higher the percentage of caloric intake derived from processed foods, the lower the diet quality. Among both adults and children, lower scores of diet quality are observed among individuals with excessive amounts of processed foods in their diet (Liu et al., 2022).

2.5.1.2 Consumption of Home Cooked Meals.

Meals cooked at home are more likely to be nutritionally adequate compared to foods eaten away from home. Healthy foods are scarcely available in urban areas and are usually more expensive than fast foods (Vilar-Compte et al., 2021). Consequently, most people who seek food away from home in urban areas may choose to consume unhealthy diets. Consuming home-cooked meals is a healthy alternative that may be cheaper for urban residents. Studies that have investigated the source of food eaten find that consumption of home-cooked meals is relatively low. In a UK study, only 26.5% of the study population reported consuming home-cooked meals in 4-day food diaries (Astbury et al., 2019). A similar Japanese national health survey study observed a higher percentage of participants regularly consuming home-cooked meals at 34.9% (Matsumoto et al., 2021).

Few studies have studied this consumption pattern in Africa. Most Africans mostly eat home-cooked food when at home and often buy food when away from home. In a study evaluating this trend among Ghanaians and Kenyans, researchers reported that most meals consumed by city residents (81.9% Ghana, 77.5% Kenya) are eaten at home (Holdsworth et al., 2020). In the study, only a few meals were eaten on the street (6.3% in Ghana and 12.2% in Kenya) or at workplaces (7.4–8.5%). This indicates that foods

eaten away from home do not significantly influence dietary habits. Since meals eaten away from home are mainly obtained away from home, these findings portray a high consumption of home-cooked meals among African city residents.

Meals consumed by people away from home in many instances are of low diet quality. Matsumoto et al. (2021) reported findings showing a high inadequacy of meals prepared away from home. The study found that most participants reporting high consumption of foods not prepared at home showed inadequate fiber and micronutrients in their diet. Similarly, Clifford Astbury et al. (2019) report a significant association between consuming home-prepared meals and achieving diet quality. In their study, the researchers observed that participants reporting consuming meals cooked at home were more likely to meet Dietary Approaches to Stopping Hypertension (DASH) diet requirements. In Nairobi, a study found that women who consumed home-cooked meals had better diet quality compared to those who frequently ate out (Mbogori et al., 2020).

2.5.1.3 Alcohol Consumption.

Alcohol consumption has been related to a higher likelihood of developing chronic disease. The WHO Global Observatory for alcohol consumption estimates that the total amount of pure alcohol per person consumed by Kenyan women was 1.1 liters in 2018 (World Bank, nd.). According to a 2015 national survey, 12.7% of Kenyans engage in heavy episodic drinking. Out of these, 40% were women, while 60% were men, according to the survey findings (Kendagor et al., 2018). In Nairobi, a study conducted in the Githurai slum reported that 20% of the 211 participants reporting alcohol use were women (Gitatui et al., 2019). In line with these data, the level of alcohol indulgence among Kenyan women seems significant.

Given its impact on pregnancy outcomes, high alcohol consumption threatens the health of a pregnant mother and that of her unborn child. The impact on health is not limited to consumption during pregnancy. As reported in a clinical trial that investigated the effect of alcohol intake before pregnancy on maternal and fetal health, alcohol confers detrimental effects (Lee et al., 2020). The findings revealed an effect on fetal viability and development when consumed two weeks before the start of pregnancy. The same behavior resulted in a risk for the development of glucose metabolic disorders and fatty liver for the mother. Aside from this, dietary patterns are influenced by alcohol consumption.

For instance, alcohol consumption contributes to total energy intake, affecting the consumption of other energy sources. The literature reviewed from published experimental and observational studies yielded similar diet patterns among alcohol drinkers, regardless of the amount taken (Cummings et al., 2020). The review reported increased fat and protein intake among moderate and light alcohol consumers. Heavy drinkers exhibited a significant impact on carbohydrate intake. While these findings show an effect on diet quality, the effect is only observed in macronutrient intake. Similarly, Brenes et al. (2021) noted that consumption of macronutrients is affected among alcohol drinkers, as alcohol tends to replace the energy that would have been obtained from food. In addition, drinkers often indulge in unhealthy eating habits, including consuming fast foods, processed foods, and red meat. The study also reported a reduced intake of healthy food groups, including dairy, fruits and vegetables, fiber, whole grains, and legumes.

In relevance to these findings, the influence of alcohol on the quality of diets consumed is apparent. Further, the relationship between alcohol consumption and diet quality may

be two ways. In a study evaluating the role of diet quality in moderating the association between alcohol use and hypertension, researchers concluded diet quality confers a negative influence on the association (Jiang et al., 2021). The study's findings intimate that diet quality mitigates the risk of hypertension. This means that light and moderate alcohol consumers with high diet quality have a reduced risk of developing hypertension compared to individuals with low diet quality scores.

2.5.1.4 Physical Activity.

This refer to "body activities that cause movement physically and they are geared towards improving as well as maintaining the physical fitness of an individual" (Koehler & Drenowatz, 2022, p.1). A lifestyle that includes regular physical activity is considered a contributing factor to maintaining good health and preventing the development of chronic disease. Combined with healthy diet practices, the effect on health is enhanced (Farhud, 2015). As per the findings from Dunneram and Jeewon (2013), people who regularly engage in physical activity are likely to have high diet quality. The women-only study observed high diet quality among those reporting high physical activity levels. In a 12-year cohort study, findings showed an increase in diet quality among participants engaging in regular physical activity (Park et al., 2020). Based on the baseline data, participants reporting high physical activity levels consistently increased their diet quality over the study periods. However, the study did not report whether changes in physical activity during the study period influenced diet. Likewise, a 4-year cohort of older adults reported that exercise at baseline predicted the diet quality of the study population (Thorpe et al., 2019). According to the authors, participants adopting physical activity are more likely to choose healthier dietary patterns.

This could be related to the motivation to maintain a wholesomely healthy lifestyle. Individuals who choose to improve their health outcomes through regular exercise will most likely adopt healthy food choices, improving diet quality. Joo et al. (2019) contend that voluntary control of dietary intake observed among partakers of regular physical activity is responsible for the improvement in diet quality among this population. In their study, the researchers discovered that those exercising for longer are less motivated to choose unhealthy food choices such as snacking, fast foods, and processed foods. The trend was similar for higher intensity as well as higher quantities of exercise.

A linear relationship exists between exercise and diet quality since the motivating factors are the same. A higher preference for exercise corresponds to a higher preference for healthy diets. Further, research has demonstrated that exercise influences the expression of appetite markers. In reference to Hubner et al. (2021), increased exercise results in improved appetite control and increased satiety sensitivity. This implies a reduction in energy intake, preventing excessive energy intake. In a Kenyan study, pregnant women who engaged in regular physical activity reported better dietary habits and higher diet quality compared to those with sedentary lifestyles (Mucheru et al., 2017). The study emphasized the importance of integrating physical activity into prenatal care programs to improve overall health outcomes for mothers and their babies.

2.6 Nutrition Literacy

Nutrition literacy is a concept which has become a significant component in achieving healthy dietary patterns. This concept is defined as “the degree to which individuals have the capacity to obtain, process, and understand nutrition information and skills needed to make appropriate nutrition decisions” (Taylor et al., 2019). It encompasses the level of nutrition knowledge and the functional capabilities to apply the knowledge

on healthy nutrition practices properly. Assessment of nutrition literacy involves evaluating an individual's knowledge of nutrition and health, energy-giving food sources and food groups and measuring food portions, reading and interpreting food labels, and consumer skills. The recently validated Nutrition Literacy Assessment Instrument (NLit), which can be adapted for different populations, is the most reliable instrument for evaluating nutrition literacy (Gibbs et al., 2018). The NLit is a validated tool for assessing nutrition literacy, which predicts dietary patterns and health outcomes. In a study conducted in Nairobi, the NLit was used to evaluate the nutrition literacy of pregnant women, revealing that those with higher literacy levels had significantly better diet quality (Karanja et al., 2021). Similarly, in a study in Ethiopia, higher nutrition literacy assessed using the NLit was associated with better dietary practices and higher dietary diversity scores among pregnant women (Gebremedhin et al., 2018). This tool has been critical in emphasizing the importance of nutrition education in improving diet quality.

Nutrition literacy predicts dietary patterns. When one is knowledgeable and skilled in nutrition and health-related information, the impact in practice is likely to be observed. As Gibbs et al. (2016) reported, high nutrition literacy influences diet quality and the health of individuals. The study reported that parents with high literacy levels had children who had high diet quality scores, as measured by the Healthy Eating Index (HEI). Moreover, the same parents were found to have healthy weights compared to parents with lower literacy levels. Taylor et al. (2019) reported identical results among chronic disease patients. In the study, nutritionally literate patients demonstrated healthier dietary patterns. Diets involving heavy intake of processed foods, red meats, sweetened foods, and fast foods were observed among those with low literacy levels.

Nutrition literacy influence on the diet habits, eventually has a lasting impact on the BMI of an individual. In line with data from a study, adolescent participants with high literacy levels had minimal chances of being obese of overweight. This data was collected from middle school students, and the impact of education level on this relationship was evident. Among adolescents in junior levels, literacy and weight had no significant association. Therefore, interventions targeting nutrition literacy could improve diet quality among young populations. Velpini (2022) looked at the efficacy of nutrition literacy intervention in improving nutrition indicators. In their systematic review of evidence, the authors discovered that literacy interventions targeting food habits and security likely influenced dietary behavior positively. According to the findings, interventions should include multiple methods, be one-on-one, and be carried out for over a month to yield substantial results. Data shows that literacy may predict pregnant women's diet quality, as observed in child populations. Therefore, exploring the influence of nutrition literacy among this group is warranted.

2.7 Diet Quality

Diet quality is “when a variety of essential food groups has been consumed as prescribed in the diet guidelines” (Dalwood et al., 2020). It reflects the ability to achieve ideal nutritional intake for the maintenance of good health and prevention of disease. It refers to the levels to which an individual’s diet intake is healthy, based on adequacy, moderation, variety, and balance (Alkerwi, 2014). Individuals who ensure these four dimensions in their diets are considered to have a high diet quality. Various indicators have been used to measure diet quality. The most commonly used include the Healthy Eating Index (HEI), Diet Quality Index (DQI), and the Healthy Diet Indicator (HDI)

(Gil et al., 2015). The indices use a combination of measures of diet variety, adequacy, balance, and nutrients that should be consumed in moderation.

The HEI is based on the American Dietary guidelines and measures the extent to which an individual fare to the guidelines as well as components of the US Food Guide Pyramid (Gil et al., 2015). It is comprised of ten components, including the five food groups of the Pyramid measured as the number of servings per day, four nutrients that should be consumed in moderation, and a measure of the variety of food items consumed. In South Africa, a study using the HEI found that 87% of pregnant women had poor diet quality, with low intakes of fruits, vegetables, and whole grains (Napier et al., 2019). Another study in Ghana using the HEI indicated that 74% of pregnant women had poor diet quality, characterized by insufficient consumption of dairy products and high consumption of starchy foods (Otoo et al., 2016). This tool has been instrumental in identifying dietary inadequacies and informing nutritional interventions in the region.

The HDI was devised to measure dietary patterns in accordance with the WHO guidelines on how to curb chronic diseases (Gil et al., 2015). It constitutes nine components, including food groups and nutrients, measuring the consumption of the recommended amounts of the diet components. These components of the index are fruits and vegetables, monosaccharides and disaccharides, dietary fiber, polyunsaturated fatty acids, proteins, saturated fatty acids, pulses, nuts and seeds and complex carbohydrates.

Originally developed in 1995, the DQI constitutes four measures; variety, adequacy, moderation, and balance (Gil et al., 2015). In the index, variety is measured from the general food consumption and must be among the food group dietary diversity, while

adequacy is measured by looking at the consumption of four food groups (fruits, vegetables, grains and fiber) and four nutrients (protein, iron, calcium, vitamin C). Balance is measured using the micronutrient and fatty acid ratio, while moderation is assessed through the consumption of sodium, saturated and total fats, and empty calories. This DQI was later revised and modified to meet various research needs. For instance, the DQI-International version is a 2003 revision that constitutes more measures and can be used for comparisons in many countries (Kim et al., 2003). In the DQI-I, variety is measured by five food groups and six food sources, and adequacy of at least four nutrients and food groups. In Tanzania, researchers found that only 29.2% of pregnant women achieved the recommended daily intake of dark green vegetables, using the DQI as a measure (John et al., 2021). A study in Nigeria using the DQI revealed that 65% of pregnant women had poor diet quality, with diets lacking in essential micronutrients such as iron and calcium (Adekanle et al., 2015). The DQI has proven effective in highlighting specific nutrient gaps and guiding public health strategies.

The Diet Quality Index Adapted for Pregnant Women (IQDAG), on the other hand, is a DQI that has been tailored to measure the diet quality of pregnant women (Crivellenti et al., 2018). It constitutes nine components; three food groups measured in servings per 1000kcal, five nutrients, and one moderation component (Ultra processed foods) measured as a percentage of total energy value. This indicator is most appropriate for pregnant women, as it assesses the intake of nutrients of specific importance in pregnancy, folate, iron, omega-3, calcium, and fiber. In Tanzania, researchers found that only 29.2% of pregnant women achieved the recommended daily intake of dark green vegetables, using the DQI as a measure (John et al., 2021). A study in Nigeria using the DQI revealed that 65% of pregnant women had poor diet quality, with diets

lacking in essential micronutrients such as iron and calcium (Adekanle et al., 2015). The DQI has proven effective in highlighting specific nutrient gaps and guiding public health strategies. This study adopts the IQDAG as it is specific to the population of interest and usually easy to contextualize to the local context of diet guidelines.

Measuring diet quality is significant because it predicts health outcomes, as the effect of good diet quality is far-reaching in ensuring optimal health and disease prevention. Poor diet quality, especially among pregnant women, endangers not only maternal health but also that of future generations. Studies have indicated that pregnant women consistently report poor diet quality in countries like South Africa. Of all 100 pregnant women surveyed by Napier et al. (2019), 98% and 32% did not meet their recommended intake for iron and zinc. The results further demonstrated that pregnant women increase their vitamin A and carbohydrate intake during pregnancy, not micronutrient-rich. This reflects partial awareness of nutrition requirements during pregnancy. In another study, only 2.5% of the study population met diet quality requirements (Van den Berg et al., 2022). The study also observed low consumption of iron and calcium-rich sources.

In Tanzania, diet quality among pregnant women is low, with vegetable intake being the most affected. In one cross-sectional study, researchers found that only 29.2% of 420 women assessed achieved daily intake of dark green vegetables, with only 14.7% meeting their intake of other vegetables (John et al., 2021). Data collected from Kenyan women also reflect similar trends. The 2014 KDHS report shows that many women in Kenya are unable to meet their nutritional needs (KNBS, 2015). According to the report, only 65% achieved the recommended intakes of fruits and vegetables and whole grains. Furthermore, there is evidence of decreasing quality of diets, as the 2022 KDHS reports than only 49% of women aged 15-49 years met the minimum dietary diversity (KNBS,

2023). The report also recorded a high prevalence of poor diet quality, with 70% of the women reporting consumption of sweet beverages and 35% reporting consumption of unhealthy foods.

Across different counties in Kenya, poor diet quality among pregnant women is well documented. In Laikipia County, a study was conducted among pregnant women, Kiboi et al. (2016) and the results indicated poor or low consumption of carbohydrates and proteins as well as micronutrients (zinc, folate, iron, and vitamin C). In a similar study in Kisii County, inadequate dietary micronutrient intake was also reported, especially for calcium, iron, and folate (Obwocha et al., 2016). Another study in Western Kenya found that only 22% of pregnant women achieved the minimum dietary diversity score, indicating a poor variety of food groups consumed (Mwangi et al., 2021). Similarly, in Makueni County, it was observed that pregnant women had low dietary diversity, with over 70% not meeting the minimum recommended dietary diversity (Mwangi et al., 2020). In a study conducted in Embu County, researchers found that 68% of pregnant women had inadequate intakes of fruits, 75% had inadequate intakes of vegetables, and 60% had inadequate intakes of protein-rich foods, which contributed to poor diet quality. Overall, 65% of the participants were found to have poor diet quality (Onyango et al., 2020).

Similarly, a study in Kitui County reported that 72% of pregnant women had low dietary diversity, with 70% having inadequate consumption of iron and 65% having inadequate consumption of vitamin A (Mwangi et al., 2021). In a study conducted in Vihiga County, Onyango et al. (2020) reported that 64% of pregnant women had low intake of iron, and 58% had low intake of folic acid, contributing to poor nutritional status. In another study in Kakamega County, 75% of pregnant women had low dietary diversity,

70% had inadequate intake of calcium, and 68% had inadequate intake of zinc, highlighting the urgent need for nutritional interventions (Wafula et al., 2019). In Marakwet County, 67% of pregnant women were reported to have poor dietary diversity, with 62% having inadequate intakes of essential micronutrients such as iron and vitamin A. Overall, 64% of the participants were found to have poor diet quality (Kipkebut et al., 2021). Inadequacies in micronutrients, such as calcium, zinc, iron, folate, and protein are alarming for a healthy pregnancy. Therefore, identifying the underlying causes of poor diet quality in this population is a critical milestone towards improving the general health of the Kenyan population.

Being a metropolitan area, Nairobi may have a variety of food sources available. However, access is not always guaranteed for all varieties of foods in urban areas (Vilar-Compte et al., 2021). Further, access to unhealthy food is also increased in urban areas, making it easy for individuals to choose to consume these foods (McCullough et al., 2022). While maternal diet quality has not been well studied in Nairobi County, a trend of low micronutrient intake and high carbohydrate intake is evident (GOK & Nairobi City County, 2020). A study conducted in the informal settlements of Nairobi found that 62% of pregnant women had inadequate dietary diversity and low intake of micronutrient-rich foods (Kimiywe et al., 2019).

Another study in Nairobi reported that 58% of pregnant women did not meet the recommended dietary diversity score, with low consumption of fruits, vegetables, and protein-rich foods (Chege et al., 2015). A more recent study highlighted that 64% of pregnant women in Nairobi had diets predominantly composed of starchy staples with limited intake of animal-source foods and leafy vegetables (Mwaniki et al., 2021). Additionally, research by Wanjohi et al. (2020) indicated that 70% of pregnant women

in Nairobi's low-income areas did not achieve the minimum dietary diversity, resulting in inadequate intake of essential nutrients such as iron, calcium, and vitamin A. It is, therefore, imperative to identify factors contributing to the poor diet quality of Kenyan pregnant mothers so as to improve the ability of the country's health systems to eradicate this threat to public health.

2.8 Gaps in Literature

i. While previous research has provided an insight on different views and results from the global and regional perspective, tailoring that to the Kenya context is critical.

ii. Despite the efforts to improve the minimum diet quality of women in Kenya, achieving optimal diet quality and minimum dietary diversity seems to be challenging for women in Kenya, hence the need to investigate the determinants of diet quality.

iii. Studies investigating diet quality among pregnant women in Kenya have not focused on Nairobi County. Being a highly metropolitan county, there is a need to determine how this influences the diet quality of pregnant women in the county.

2.9 Conceptual Framework

The conceptual framework of this study is represented in Figure 1.1, which shows the consanguinity linking the independent and dependent variables under investigation. The independent variables are maternal characteristics and nutrition literacy which affect the dependent variable, which is diet quality among pregnant women attending antenatal care.

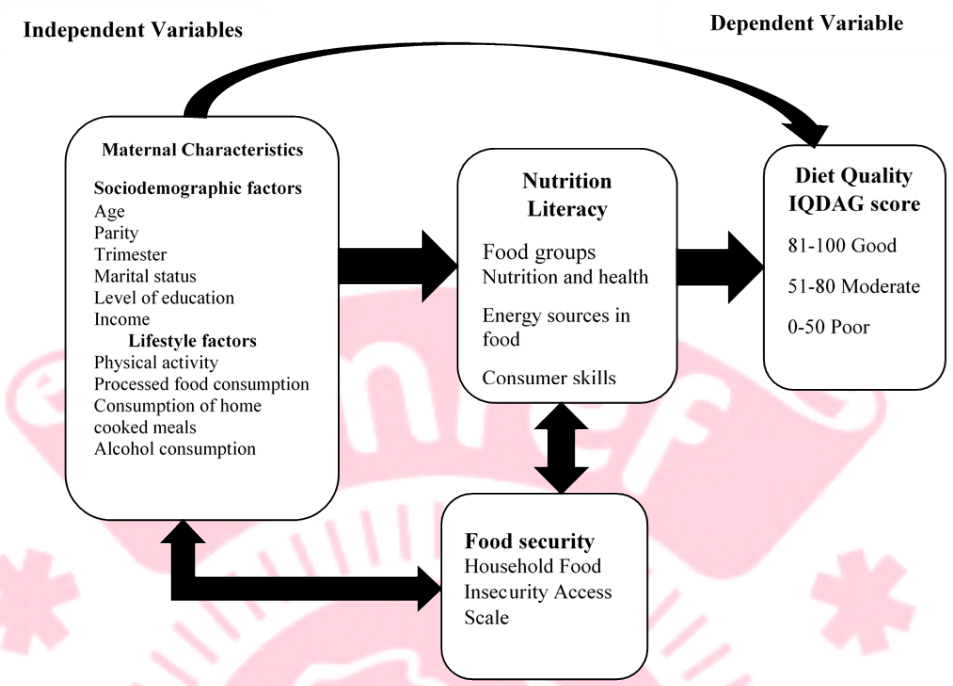

Figure 2.1: Conceptual Framework

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter describes the methodology used in the study. Aspects described include the research design adopted, location, and the population on which the study was undertaken. Furthermore, the sampling techniques, research instruments, data collection, management, and analysis procedures are described alongside the ethical considerations.

3.2 Study Design

A descriptive cross-sectional research design was used in this study. Quantitative methods were applied in this study.

3.3 Study Site

The study was conducted at St. Mary's Mission Hospital, a privately owned mission hospital, located in Langata sub-county, in Nairobi County, Kenya (Figure 3.2). The county is experiencing rapid population growth, accompanied by an expansion of informal settlements. The county has seventeen sub-counties, each with both public and private health facilities. This facility was selected since it is strategically positioned to serve the lower- and middle-income communities from Kibera, a low-income informal settlement, and Langata, a middle-income settlement, and the environs. Further, it has a high rate of antenatal attendance, with at least 48% completion rate of 4th ANC visit according to data from KHIS, 2022.

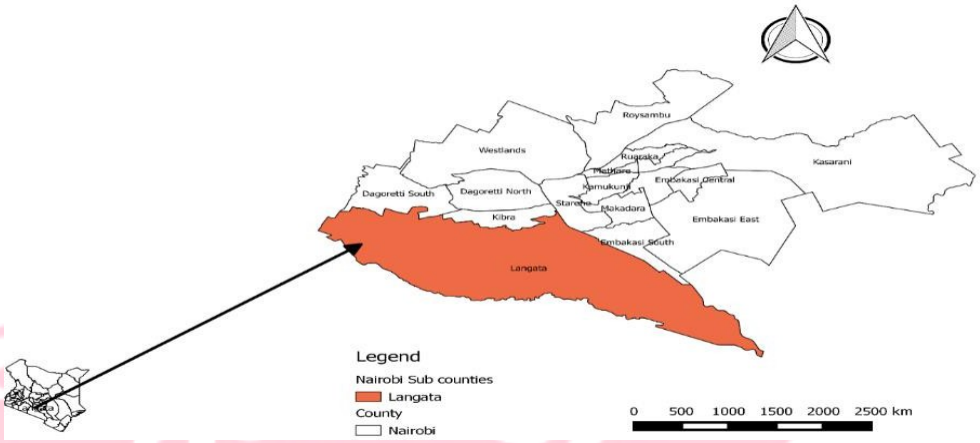

Figure 3.1: Study Location

Source: Google Maps, 2022

3.4 Study population

The study population was pregnant women attending the antenatal clinic at St. Mary's Mission Hospital in Nairobi County.

3.4.1 Inclusion Criteria

i. Pregnant women attending the ANC in St. Mary's Mission Hospital

ii. Pregnant women who gave consent

iii. Residents of Nairobi County for a period not shorter than six months prior to the date of data collection.

iv. Pregnant women aged between 15 and 50 years

3.4.2 Exclusion Criteria

Pregnant women with the following characteristics were excluded:

i. Pre-existing chronic ailments including anaemia

ii. Gynaecological /obstetric complications

3.5 Sample Size Calculation

The Fischers' formula (1935) was used to calculate the sample size where:

$$n = \frac{Z^2 P (1 - P)}{d^2}$$

Where n = sample size,

Z = Normal deviation at the desired confidence interval. In this study, a Z value at 95% CI will be 1.96

P = Proportion of the population with the desired characteristic (20.2%)

d = Degree of precision = 0.05

$$n_1 = \frac{1.96^2 * 0.2(1 - 0.2)}{0.05^2} = 247.70 \quad = 248$$

Since the proportion of maternal undernutrition is 20.2%, a 20% P-value was used (Prince et al 2020). Maternal undernutrition was used because it a proxy indicator of diet quality

3.6 Sampling procedures

The ANC register indicate an average attendance of 21 pregnant women per day at St. Marys. Consecutive sampling of all consenting pregnant women attending antenatal

clinic in St. Mary's Mission Hospital in Nairobi was employed, till the required sample size was achieved.

3.7 Study instruments

3.7.1 Questionnaire

The study used one researcher-administered questionnaire that was structured into three sections to collect data on maternal characteristics, nutrition literacy and diet quality.

Section A of the questionnaire constituted of questions for collecting data on maternal characteristics, with subsections for sociodemographic characteristics, food security and lifestyle factors. Socio-demographic characteristics assessed included age, parity, number of visits food security and lifestyle factors. Questions adapted from the Household Food Insecurity Access Scale (HFIAS) Version 3, which has been validated among pregnant women in Africa (Natamba et al., 2015), was used to measure food security as guided by Coates et al. (2007). Lifestyle factors included physical activity, alcohol intake, consumption of fast foods, and consumption of home-made food. Lifestyle factors were assessed using questions adopted from World Health Organization's instrument for STEPwise approach to surveillance questionnaire (WHO, 2020) and the International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003).

Section B of the questionnaire constituted questions used for the assessment of nutrition literacy. It was measured using a questionnaire adopted and modified from the Nutrition Literacy Assessment Instrument (NLit) with four subclasses for scoring (Gibbs et al., 2018). The four subscales were; Food groups, Nutrition and health, Energy sources in food and Consumer skills. Although not yet validated in the African context, the Nlit tool was selected as a reference due to its focus on its focus on critical aspects of

nutrition during pregnancy, hence its ability to evaluate respondents' knowledge and understanding of food, its, sources and its significance in diet during pregnancy. The specific food items used in the assessment of nutrition literacy were selected as a result of an identification of the most popular foods from various food groups that were available at the local markets in Nairobi County during the pretest survey.

Section C of the questionnaire assessed diet quality. The section constituted a 24-hour recall, which was used to obtain data used to determine the diet quality.

3.8 Pretesting

The pretesting of the instruments was conducted on a small sample of respondents with the same characteristics as the study sample for purposes of pretesting the research instruments. A sample of ten pregnant women and three hospital staff was drawn from New Starehe District Hospital in Starehe Sub County. During pre-testing of the instrument, attention was focused on the questions that were not clear or were ambiguous. The results of the pre-test were used to refine the instruments by revising questions.

3.9 Validity of the instruments

The validity of the questionnaire was established through face validity and content validity. To establish face validity, the researcher read through the instruments to determine whether they measured the intended constructs. Additionally, respondents were asked to rate the instruments' effectiveness during the pre-test testing study. Content validity was established by nutrition research professionals who determined how well each instrument measured the intended variables. The researcher enlisted four experts to perform content validation of instruments.

3.10 Reliability of the Study

Reliability was established by administering tests to a group of individuals and correlating the first set of scores with the second. The less the variation, the more reliable an instrument is.

3.11 Data Collection Procedures

Data was collected by research assistants using the questionnaire.

3.11.1 Training of Research Assistants

The researcher conducted a two-day training session for research assistants. The training involved instruction on the study objectives, data collection tools and methods. Training was tailored to ensure understanding of the tools, the questions in each tool, data to be collected and competency on how to collect the required data. It included demonstrations, exercises such as role playing and identification and classification of foods into food groups, and field practice to ensure understanding of the eliciting data from participants and recording on the questionnaire. Researchers were instructed to simplify the questions for the respondents and translate where necessary to ensure that respondents understood what each question required of them and that the responses obtained were correct as envisioned in the questionnaire.

3.12 Data management and analysis

Once data was collected using the questionnaire, it was entered in Microsoft Excel, cleaned and imported into SPSS Version 26 for analysis.

3.12.1 Social Demographic Characteristics.

Descriptive statistics was used to analyze social demographic characteristics.

3.12.2 Food Security

The responses on each of the nine-food security related questions assessing food security were used to assign scores for each respondent as guided by the HFIAS indicator guide (Coates et al., 2007). For every question where a respondent responded with "No" the respondent was assigned a score of zero. For those who responded with "Yes", a score of 1 was assigned to those who stated that the occurrence happened rarely, 2 for those who stated that it happened sometimes, and 3 for those who stated that it happened often. Therefore, the maximum score for each question was 3, while minimum and maximum score for all the nine questions was 0 and 27, respectively. The scores were used to determine food security status, which was categorized into food secure, mildly food insecure, moderately food insecure, and severely food insecure. This was done by dividing the possible maximum score by three to generate terciles. Consequently, respondents with a total score of 0 were categorized as food secure, those with a total score of 1-9 were mildly food insecure, those with scores of 10-18 were moderately food insecure, and those with scores of 19-27 were severely food insecure.

3.12.3 Physical Activity

Responses from the physical activity questions were used to assign scores to respondents as prescribed in the IPAQ scoring protocol (IPAQ Group, 2005). The hours of physical activity were converted to minutes, which was used to calculate activity intensity by computing the metabolic equivalent of task (MET). The MET was calculated as minutes per week by multiplying the MET values by number of minutes

spent doing the activity and number of days the activity was undertaken as shown in Figure 3.2. The total physical activity was summed up for all activities for each respondent and used to categorize physical activity intensity. Total physical activity in MET-minutes per week was used to categorize physical activity as low, moderate or high in line with the IPAQ guidelines. Thus, respondents who had achieved less than 600 MET minutes a week were assigned a low physical activity score. Those who had achieved 600 MET minutes a week but had attained below 1500 MET minutes a week were assigned a moderate physical activity score, while those who had achieved a minimum of 1500 MET minutes a week were assigned a high physical activity score.

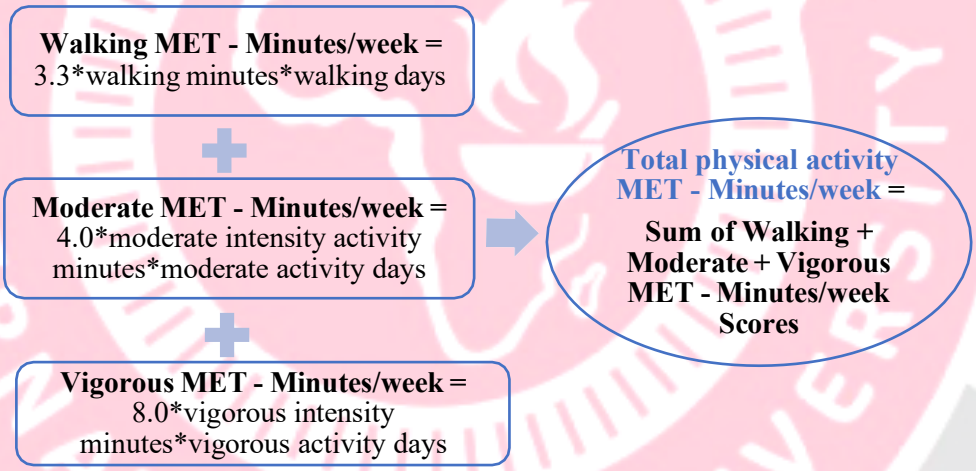

Figure 3.2: Computation of MET-minutes/week

Source: IPAQ scoring Guide,2005.

3.12.4 Nutrition Literacy

Nutrition literacy was assessed by asking respondents three questions in each of the four subscales of the adopted and modified Nutrition Literacy Assessment Instrument (NLit) (Gibbs et al., 2018). For each question respondents were presented with multiple choices and asked to identify the correct answer. Responses from all four

subscales of nutrition literacy were used to assign scores. For every question answered correctly, the respondent was awarded a score of 1. A score of 0 was awarded for each question answered wrong. Therefore, the maximum score for all the four sections was 12 and the minimum was 0. The maximum score was divided by three to generate terciles, which were used to categorize nutrition literacy scores into poor, moderate and good. Scores between zero and four were considered poor, scores between five and eight were considered moderate, and scores between nine and twelve were considered good.

3.12.5 Diet Quality

3.12.5.1 Analysis of 24-hour Recall Data

This study adopted the IQDAG for the assessment of diet quality as it was developed for use among pregnant women Crivellenti et al. (2018) and has been used previously in the African context (Van den Berg et al., 2022). Data from the 24-hour recall was analysed and the items of the IQDAG were isolated for analysis. The IQDAG constitutes nine components; three food groups measured in servings per 1000kcal, five nutrients, and one moderation component (Ultra-processed foods) measured as a percentage of total energy intake. The 24-hour recall data was entered into Nutrisurvey software and analyzed to determine each respondent's intake of calcium, iron, folate, omega-3 and fiber. The same software was used to determine total energy intake as well as energy intake from ultra-processed foods. Ultra-processed foods included in the analysis included processed meats, mass-produced pastries, deep-fried foods, carbonated drinks, biscuits, and sweets. The consumption of ultra-processed food was expressed as a percentage of the total energy intake. The amount of fruits, vegetables, and legumes consumed was computed to determine the number of servings consumed.

Serving sizes were standardized using the Food Exchange Lists compiled from Wheeler et al. (2008) and the number of servings of fruits, vegetables, and legumes consumed were computed and categorized into servings per 1000kcal of energy.

3.12.5.2 Determination of recommended Intakes.

Scoring for the nutrient components (calcium, iron, folate, omega-3 and fiber) was done using recommendations outlined in the Kenya clinical nutrition and dietetics manual (MOH, 2020) and the Dietary Reference Intakes (Institute of Medicine, 2005). On the other hand, recommended servings of fruits, vegetables, legumes and the methodology of determining the minimum and maximum scores of ultra-processed foods were adapted from Van den Berg et al. (2022). As the study showed low consumption of ultra-processed foods, the 25^{th} percentile was used to determine the recommendation. Consequently, those who were below the 26^{th} percentile on the distribution curve were considered to have met the requirement for ultra-processed food consumption.

3.12.5.3 IQDAG Scoring

Each respondent's intake of fruits, vegetables, and legumes was determined as number of standard servings and divided by the recommended servings per 1000kcal to produce scores of out of 10. Respondents who had consumed the recommended intake value were assigned the maximum score of 10, while those who had not consumed food from any of the food groups were assigned the minimum score of zero. Respondents who had consumed less than the recommended intake were assigned scores between 1 and 9 based on the result obtained after dividing their intake with the recommended intake of servings per 1000kcal. Similarly, each respondent's intake of fiber, iron, omega-3, calcium, and folate was divided by the respective recommended intake and computed to produce scores of out of 10.

Scoring for ultra-processed food was done based on the study population's distribution curve for its consumption (Van den Berg et al., 2022). Respondents with low consumption of ultra-processed foods were assigned higher scores while those with high consumption were assigned lower scores. The cut-off points for assigning minimum and maximum scores were based on the 25th and 85th percentiles in the distribution curve. Intakes equal or below the 25th percentile were assigned the maximum score of 20 while intakes equal or above the 85th percentile were assigned the minimum score of 0. Table 3.3.1 illustrates the scoring criteria.

Table 3.0.1: IQDAG Scoring Guide

IQDAG Component	Score range		
	0	**10**	**20**
Fresh fruit (standard servings / 1000 kCal)	0	≥1.5	
Vegetables (standard servings / 1000 kCal)	0	≥1.5	
Legumes (standard servings / 1000 kCal)	0	≥0.5	
Fibre (g)	0	≥28	
Omega-3 (mg)	0	≥1.4	
Iron (mg)	0	≥27	
Calcium (mg)	0	≥1000	
Folate (µg)	0	≥600	
Ultra-processed food (% of TEI)	≥17		<17

3.12.5.4 Overall Diet Quality Scoring

The total scores of the IQDAG components were computed and categorized into poor, moderate and good as follows: 81-100 was considered good dietary quality for pregnancy, 51–80 points were considered moderate dietary quality for pregnancy, and 0-50 points were poor dietary quality for pregnancy.

3.12.6 Statistical Analysis

The relationship between diet quality, nutrition literacy and maternal characteristics was statistically analyzed using Chi-square tests and binary logistics regression to assess statistical relationships and significance at the bivariate and multivariate levels respectively.

3.13 Ethical Considerations

3.13.1 Approval

Approval to carry out the study was obtained from AMREF International University Graduate School and Ethics Review Committee (permit number ESRC-P1340/2022) and National Commission for Science, Technology and Innovation (NACOSTI) (approval number 963260). Approval was also sought from the St. Mary's Mission hospital administration prior to the study.

3.13.2 Confidentiality

All information collected was treated with the utmost confidentiality. All study participants were treated with respect during and after recruitment. The information gathered will be used solely for this study and will be divulged only if it is in the interest of the respondent and with his or her approval or through the AMREF International University Graduate School and Ethics and Scientific Review Committee (ESRC).

The names of the respondents were not indicated in the screening questionnaire. A study logbook which was kept by the study research assistant had the name and the IP number of the respondent for ease of communicating the patient's results and filing a copy in their files.

3.13.3 Consent

The study participants were informed on what the study entailed, its benefits and risks. The participants were also told that they were free to withdraw from the study should they feel necessary, where the study would not jeopardize the treatment or management during their stay in the hospital. Written consent was obtained from the participants by way of appending their signatures on the informed consent form.

3.13.4 Risks Associated with This Study

Medical research holds the potential to present psychological, social, emotional and physical hazards where measures have been implemented to reduce the risks in this study. One potential risk of being in this study was loss of privacy as the survey required participants to answer personal questions. However, everything obtained from the respondents was kept as confidential as possible. Code numbers were used to identify respondents in a password-protected computer database and all of paper records were kept in a locked file cabinet.

Respondents were also informed that there was a potential to feel uncomfortable while answering questions. In these instances, they were informed that they could skip any questions they did not wish to answer. Respondents had the right to terminate the interview or refuse to answer specific questions asked during the interview.

3.13.5 Benefits

The study participants did not receive any direct benefits.

3.13.6 Compensation

There was no compensation for the study participants throughout the study.

3.13.7 Withdrawal from The Study

Respondents were free to refuse participation in the study and withdraw from the study at any time without justification.

3.13.8 Dissemination Plan

The research study results are being disseminated through publishing in the AMREF International University (AMIU) Graduate School repository and sharing copies with St. Mary's Mission Hospital Nairobi County. The research work will also be published in peer-reviewed journals and hard copies availed at the AMIU library.

3.14 Study Limitations

The study was centered and limited to pregnant women receiving antenatal services at St. Mary's Mission Hospital. antenatal clinic. The sampled respondents were limited to this hospital hence the findings cannot be generalized to Nairobi County.

CHAPTER 4: RESULTS

4.1 Introduction

This study investigated the determinants of diet quality of pregnant women attending St. Mary's Mission Hospital, Nairobi. This chapter outlines the results according to the study objectives. The data is presented in descriptive and inferential statistics. Descriptive data is presented using means, frequencies, and percentages, while inferential data is presented as correlations and associations between diet quality and the variables examined.

4.2 Maternal Characteristics

4.2.1 Socio-Demographic Characteristics

The study involved 248 respondents. The socio-demographic characteristics examined included age, marital status, education level and employment status as shown in Table 4.1. The majority of the respondents were 26-30 years old (39.1%) and 20- 25 years old (29%). Only a few participants were below 20 years old (1.2%) or more than 40 years old (1.6%). Majority of the respondents were married (82.3%), while 3.2% were widowed. Sixteen per cent of the respondents had studied up to the tertiary level. Close to half of the respondents (48.4%) and 7.7% had no formal education. Most of the respondents (59.3%) were housewives, 21.8% were self-employed and 19.1% were employed by the government or private organizations.

Table 0.1: Sociodemographic Characteristics

Variable	Frequency (n)	Percent (%)
Age Range n= 248		
Less than 20 years	3	1.2
20-25 years	72	29.0
26-30 years	97	39.1
31-35 years	55	22.2
36-40 years	17	6.9
Over 40 years	4	1.6
Marital Status n= 248		
Single	12	4.8
Married	204	82.3
Divorced	24	9.7
Widowed	8	3.2
Education Level n= 248		
None	19	7.7
Primary	69	27.8
Secondary	120	48.4
Tertiary	40	16.1
Employment Status n= 248		
Self-employed	54	21.8
Government/Privately employed	47	19.0
Housewife	147	59.3

4.2.2 Obstetric and ANC Information

Obstetric and ANC visit data was collected to gather information related to pregnant mothers' prenatal well-being. These included respondents' parity, pregnancy stage, number of prenatal visits, and services received during visits as shown in Tables 4.2 and 4.3.

A third (31.5%) reported that the current pregnancy was their first. Close to half of the respondents (43.5%) were in their second pregnancy, 19.4% in their third, and 5.6%

were in their fourth pregnancy. Forty-four per cent of the respondents were in their first trimester, 37.1% were in their second trimester, and 18.9% were in their third trimester. Only four respondents (1.6%) were attending clinic for the first time at the time of the study. Majority of the respondents had attained the recommended number of ANC visits per trimester 100% trimester 1, 93% trimester 2 and 83% at trimester 3.

Table 0.2: Respondents' Obstetric and ANC Information

Variable	Frequency(n)	Percent (%)
Parity n=248		
First	78	31.5
Second	108	43.5
Third	48	19.4
Fourth	14	5.6
Pregnancy Stage n=248		
First trimester	109	44.0
Second trimester	92	37.1
Third trimester	47	18.9
ANC Attendance n=248		
First Trimester		
1 or more visits	109	100
None	0	0
Second Trimester		
2 or more visits	86	93
Less than 2	6	7
Third trimester		
3 or more visits	39	83
less than 3	8	17

As shown in Table 4.3, most respondents (76.2%) had received a service other than the routine antenatal checkup during their ANC visit, while only 23.8% (n=59) reported that they had not received other services. Of those who received other services during

their ANC visit, 81.5% received nutrition services. The rest (18.5%) received other services such as medical, PMTCT, and laboratory services.

Table 0.3: Services received during ANC Visits

Received other services	Frequency (n)	Percent (%)	Nutrition Service Received	Frequency (n)	Percent (%)
Yes	189	76.2	Yes	154	81.5
No	59	23.8	No	35	18.5
Total	**248**	**100**	**Total**	**189**	**100**

4.2.3 Lifestyle Factors

Lifestyle factors assessed physical activity, alcohol use, consumption of home-made meals and fast foods. Physical activity status was assessed by asking the respondents questions pertaining to their activity derived from the International Physical Activity Questionnaire (IPAQ).

4.2.3.1 Physical Activity

First, respondents were asked to state the frequency of engaging in physical activity shown in Table 4.6 (Vigorous category). Majority of the respondents (56.9%) reported not having undertaken any vigorous physical activity within the previous week, while only 6.5% had exercised for four days of the week. Of those who had reported engaging

in vigorous physical activity, 14.0% did so for more than an hour a day and 43.9% did so for less than 30 minutes per day.

Table 0.4: Vigorous Physical Activity

Vigorous Activity		Frequency (n)	Percent (%)
No. of days respondents engaged in vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling in the previous week	None	141	56.9
	1	41	16.5
	2	19	7.7
	3	31	12.5
	4	16	6.5
	Total	**248**	**100**
Time spent doing vigorous physical activities on one of those days	30 Minutes -1 Hour	45	42.1
	Less than 30 Minutes	47	43.9
	More than 1Hour	15	14.0
	Total	**107**	**100**

Second, respondents were required to state how frequently they engaged in moderate physical activity as illustrated in Table 4.7. More than half (58.9%) of the study participants had not engaged in moderate physical activity in the previous week, while 5.6% had engaged in moderate activity on four days of the previous week.

Table 0.5: Moderate Physical Activity

Moderate Activity		Frequency (n)	Percent (%)
No. of days respondents engaged in moderate physical activities like carrying light loads, washing windows, scrubbing floors and sweeping in the previous week.	None	146	58.9
	1	22	8.9
	2	41	16.5
	3	25	10.1
	4	14	5.6
	Total	**248**	**100**
Time spent doing moderate physical activities in one of those days.	30 Minutes -1 Hour	44	43.2
	Less than 30 Minutes	54	52.9
	More than 1 Hour	4	3.9
	Total	**102**	**100**

The participants were also asked to state how much time was spend engaging in physical activity for leisure. As shown in Table 4.8, a third of the respondents (31.0%) had engaged in leisure time physical activity on four days of the week. Six respondents (2.4%) did not engage in leisure time physical activity on any day of the week, while nineteen (7.7%) did so every day of the week. Of those who reported exercising for leisure, 33.1% usually did so for a period between 30 minutes and one hour and 20.6% exceeded one hour.

Table 0.6: Recreation and Leisure Time Physical Activity

Recreation and Leisure Time Activity		Frequency (n)	Percent (%)
No. of days respondents engaged in activities solely for leisure, recreation or exercise or walking to travel from place to place in the previous week.	None	6	2.4
	1	16	6.5
	2	51	20.6
	3	77	31.0
	4	47	19.0
	5	17	6.9
	6	15	6.0
	7	19	7.6
	Total	**248**	**100**
Time spent doing leisure time physical activities in one of those days.	30 Minutes -1 Hour	80	33.1
	Less than 30 Minutes	112	46.3
	More than 1 Hour	50	20.6
	Total	**248**	**100**

Lastly, the researcher collected data on respondents' sedentary activity. This was done by asking respondents to state the amount of time spent sitting. As shown in Table 4.9, all respondents stated that they spent time sitting every day. The majority of the respondents (47.6%) spent over 5 hours sitting every day. Few respondents (23.8%) spent less than three hours sitting, and 28.6% spent between 3 and 5 hours a day sitting.

Table 0.7: Time Spent Sitting

Time spent sitting		Frequency (n)	Percent (%)
Time spent sitting per day	Less than 3 Hours per day	59	23.8
	3-5 Hours per day	71	28.6
	More than 5 Hours per day	118	47.6
	Total	**248**	**100.0**

Respondents' physical activity was converted to minutes, then MET minutes per week for each category of physical activity was calculated and summed up for scoring. Results of the physical activity scores show that majority of the respondents' physical activity level was moderate (70.2%) as shown in Table 4.10. Only 9.7% had a high physical activity level, with 20.2% having a low activity level.

Table 0.8: Physical Activity Status

Physical Activity	Scores	Frequency(n)	Percent (%)
High	1500 or more MET minutes a week	24	9.7
Moderate	600 – 1499 MET minutes a week	174	70.2
Low	Less than 600 MET minutes a week	50	20.2
Total		**248**	**100**

4.2.3.2 Alcohol Intake

The respondents were asked whether they usually took alcohol and their frequency of alcohol intake. Table 4.11 illustrates the results of alcohol intake. Only 6.5% of the participants were in the habit of taking alcohol. Of these, 68.8% indulged only once a week, while 31.2% did this twice a week.

Table 0.9: Respondents' Alcohol Consumption

Alcohol Consumption	n	%	Frequency of alcohol consumption	n	%
Consume alcohol	16	6.5	Once per week	11	68.8
Do not consume alcohol	232	93.5	Twice per week	5	31.2
Total	**248**	**100.0**		**16**	**100.0**

4.2.3.3 Consumption of Home-prepared Food and Fast Foods

Consumption of home-made food was a common occurrence among the study participants as illustrated in Table 4.12. This is because 93.5% consumed food prepared at home every day. Fast food consumption was not common among the respondents interviewed. The majority (85.5%) of the respondents had not consumed fast foods, while only 14.5% (n=36) had consumed fast foods in the previous week.

Table 0.10: Consumption of Home prepared food and fast foods

Consumption of Home prepared food	N	%	Consumption of fast foods	n	%
5 days per week	2	0.8	0 days per week	212	85.5
6 days per week	14	5.6	1 day per week	14	5.6
7 days per week	232	93.5	2 days per week	12	4.8
			3 days per week	9	3.6
			4 days per week	1	0.4
Total	**248**	**100.0**	**Total**	**248**	**100.0**

4.3 Food Security

The study sought to assess respondents' food security status. The results are illustrated in Table 4.4. Majority of the respondents (72.2%) reported concerned that their household might face insufficient food supply during previous week. When asked whether they experienced having to consume a restricted range of foods due to resource scarcity, 79.8% stated that they had experienced the occurrence, with 44.9% experiencing it often. All but a third (30.2%) had to consume certain foods that they did

not wish to consume due to insufficient resources to acquire other varieties in the previous week. A hundred and seventy-eight (71.8%) had to consume lesser meal sizes than what they desired owing to a lack of resources. On being asked whether they experienced having to consume fewer meals per day owing to insufficient food availability, 86.3% answered "Yes". Only 12.6% of these had the experience often, with 57.5% experiencing it rarely.

Instances where there was a complete absence of any kind of food in the household due to the absence of resources occurred in 72.2% of the respondents. This was a rare occurrence for 15.6% of these respondents, and more frequent for 39.7% of them. Of the 86.3% who reported going to bed hungry at night due to insufficient food in the previous week, only 12.6% experienced it often. Half of the respondents (49.6%) reported having gone an entire day and night without consuming anything due to insufficient food availability.

Table 0.11: Food Security Status

Food security Question	**Response**			**Frequency**		
		N	**%**		**n**	**%**
Concerned that there won't be sufficient food in the household	Yes	179	72.2	Often (more than10 times)	71	39.7
	No	69	27.8	Sometimes (3-10 times)	80	44.7
				Rarely (1-times)	28	15.6
	Total	248	100	Total	179	100.0
Unable to consume the preferred food due to resource limitation	Yes	198	79.8	Often (more than10 times)	55	27.8
	No	50	20.2	Sometimes (3-10 times)	106	53.5
				Rarely (1-times)	37	18.7
	Total	248	100.0	Total	198	100.0
Had to consume a restricted range of foods due to resource constraints.	Yes	198	79.8	Often (more than10 times)	89	44.9
	No	50	20.2	Sometimes (3-10 times)	65	32.8
				Rarely (1-times)	89	44.9
	Total	248	100	Total	198	100.0

Had to eat some foods that you did not want to eat because of lack of resources to obtain other types	Yes	173	69.8	Often (more than10 times)	26	15.0
	No	75	30.2	Sometimes (3-10 times)	56	32.4
				Rarely (1-times)	91	52.6
	Total	248	100	Total	173	100.0
Had to eat a smaller meal than you felt you needed because there was not enough food	Yes	178	71.8	Often (more than10 times)	85	47.8
	No	70	28.2	Sometimes (3-10 times)	64	36.0
				Rarely (1-times)	29	16.3
	Total	248	100	Total	178	100.0
Had to eat fewer meals in a day because there was not enough food	Yes	214	86.3	Often (more than10 times)	27	12.6
	No	34	13.7	Sometimes (3-10 times)	64	29.9
				Rarely (1-times)	123	57.5
	Total	248	100		214	100.0
An occurrence when there was no food to eat of any kind in your household because of a lack of resources to get food	Yes	179	72.2	Often (more than10 times)	71	39.7
	No	69	27.8	Sometimes (3-10 times)	80	44.7
				Rarely (1-times)	28	15.6
	Total	248	100		179	100.0
Went to sleep at night hungry because there was not enough food	Yes	214	86.3	Often (more than10 times)	27	12.6
	No	34	13.7	Sometimes (3-10 times)	64	29.9
				Rarely (1-times)	123	57.5
	Total	248	100		214	100.0
Went a whole day and night without eating anything because there was not enough food	Yes	123	49.6	Often (more than10 times)	43	35.0
	No	125	50.4	Sometimes (3-10 times)	40	32.5
				Rarely (1-times)	43	35.0
	Total	248	100		123	100.0

The scores of the food security occurrences were tabulated and classified to determine the status results are shown in Table 4.5. Only 6% (n=15) of the participants were found to be food secure, while 9.3% (n=23) were experiencing severe food insecurity. Those who were moderately food insecure were 35.9% (n=89) of the total population sampled, with 48.8% (n=121) being mildly food insecure.

Table 0.12: Food Security Status

Food Security Status	Scores	Frequency(n)	Percent (%)
Food Secure	0	15	6.0
Moderately Food Secure	1-9	89	35.9
Mildly Food Insecure	10-18	121	48.8
Severely Food Insecure	19-27	23	9.3
Total		**248**	**100**

4.3 Nutrition Literacy

4.3.1 Subscale I: Nutrition and Health

Nutrition and health were assessed using three questions requiring the respondents to identify nutrient-dense, energy-dense, and ultra-processed foods. Most respondents (64.5%) correctly identified the nutrient-dense food, 10.9% correctly identified the energy-dense food, and 87.1% correctly pointed out ultra-processed foods as shown in Table 4.13.

Table 0.13: Nutrition and Health Responses

Question	Response	
	Frequency (n)	**Percent (%)**
Nutrient-dense food that should be consumed most often		
Regular soda	48	19.4
French fries	40	16.1
An orange	106	42.7
Apple juice	54	21.8
Total	**248**	**100.0**
Energy-dense food that should be consumed with moderation		
Beans	140	56.5
Cabbage	81	32.7
Fried chicken	19	7.7

French fries	8	3.2
Total	**248**	**100.0**
Ultra-processed food that should be avoided in the diet		
Fresh fruit juice	31	12.5
Sausages	31	12.5
Rice	1	0.4
Soda	185	74.6
Total	**248**	**100.0**

4.3.2 Subscale II: Energy Sources in Food

In this section, respondents were asked questions that assessed their knowledge on the calorie content of foods as shown in Table 4.14. respondents demonstrated high knowledge of macronutrient sources, with only 6% failing to identify fat sources, while 4% and 2% failed to identify protein and carbohydrate sources respectively.

Table 0.14: Energy Sources in Food Responses

Answer	Frequency (n)	Percent (%)
Nutrient found in large amounts in Vegetable oil and butter		
Vitamin E	7	2.8
Carbohydrate	4	1.6
Protein	4	1.6
Fat	233	94.0
Total	**248**	**100.0**
Nutrient found in large amounts in meat and beans		
Iron	2	0.8
Carbohydrate	4	1.6
Protein	238	96.0
Fat	4	1.6
Total	**248**	**100.0**
Nutrient found in large amounts in rice and maize		
Vitamin A	3	1.2
Carbohydrate	243	98.0
Protein	1	0.4
Fat	1	0.4
Total	**248**	**100.0**

4.3.3 : Subscale III: Food Groups

The third section of nutrition literacy examined respondents' knowledge of food groups. Respondents were asked to identify which food group a food item belongs to. The food items included were rice, milk and margarine. Six choices of different food groups were provided to respondents, including grains, vegetables, fruits, protein, fats and oils, and added sugars. An overwhelmingly high number of respondents correctly placed rice (88.7%), milk (92.7%), and margarine (94.8%) into their appropriate food groups as shown in Table 4.15.

Table 0.15: Food Groups Responses

Answer	Frequency (n)	Percent (%)
Food group that rice belongs to		
Grains	220	88.7
Vegetables	7	2.8
Fruits	2	0.8
Legumes	1	0.4
Fats and Oils	1	0.4
Added sugars	17	6.9
Total	**248**	**100.0**
Food group that milk belongs to		
Dairy	230	92.7
Fats and oils	18	7.3
Total	**248**	**100.0**
Food group that margarine belongs to		
Grains	2	0.8
Fats and Oils	235	94.8
Added sugars	11	4.4
Total	**248**	**100.0**

4.3.4 Subscale IV: Consumer Skills

This section assessed respondents' ability to identify healthy foods from the choices provided as shown in Table 4.16. First, respondents were asked to identify which form of orange provided the healthiest nutrients if all servings contained the same number of calories. A large proportion of the respondents (92.3%) stated that there was no nutritional difference between orange juice with no sugar added and an orange and only

2.4% correctly selected an orange as the healthy choice. Secondly, respondents were asked to pick the healthier choice between stewed beef and fried beef. Most respondents (88.7%) correctly selected stewed beef and 4.0% stated that there was no difference in the nutrition content of the two items. Lastly, respondents were told to pick the healthier choice between canned tomato paste and fresh tomatoes. Most respondents (81.0%) correctly indicated that fresh tomatoes were healthier choice.

Table 0.16: Consumer Skills Responses

Food that provides the most healthful nutrients overall	**Frequency (n)**	**Percent (%)**
Oranges		
Orange juice with no sugar added	13	5.2
An orange	6	2.4
Orange juice with no sugar added is equal to an orange in nutrition	229	92.3
Total	**248**	**100.0**
Beef		
Stewed beef	220	88.7
Fried beef	18	7.3
There is no difference in nutrition content of the two foods	10	4.0
Total	**248**	**100.0**
Tomatoes		
Canned tomato paste	23	9.3
Fresh tomatoes	201	81.0
There is no difference in nutrition content of the two foods	24	9.7
Total	**248**	**100.0**

The Responses for each section were scored, with respondents scoring 1 for every correct answer and 0 for each wrong answer or question not answered. The scores for all sections were summed up to generate the overall nutrition literacy level. The total scores were categorized into low, moderate and good as illustrated in Table 4.17.

Nutrition literacy was good among majority of the respondents (62.1%). While only 6.5% had poor nutrition literacy scores, 31.5% had moderate nutrition literacy.

Table 0.17: Nutrition Literacy Level

Nutrition Literacy level	Scores	Frequency(n)	Percent (%)
Poor	0-4	16	6.5
Moderate	5-8	78	31.5
Good	9-12	154	62.1
Total		**248**	**100**

4.4 Measurement of Diet Quality

The study's main objective was to identify determinants of diet quality among the target population. Consequently, the researcher assessed respondents' diet quality by administering a 24-hour recall, where the items of the IQDAG were isolated for analysis. Table 4.20 shows the minimum, maximum, and average intakes of the IQDAG components.

Table 0.18: Daily Intake of IQDAG components

Item	Unit	Minimum	Maximum	Mean	Std. Deviation
Fresh fruits	(servings/1000kcal)	1	5	3.16	1.458
Vegetables	(servings/1000kcal)	3	9	6.21	1.996
Legumes	(servings/1000kcal)	0	5	2.40	1.707
Calcium	(mg)	109	1199.0	627.85	334.162
Iron	(mg)	13	29.0	21.21	4.875
Folate	(µg)	351	716.0	531.52	112.507
Fibre	(g)	18	31.0	26.32	4.327
Omega-3	(g)	0.0	1.7	0.80	0.497
Ultra-processed food	(%TEV)	9	19.0	14.06	3.174

The average intake of fruits (3.16 servings/1000kcal), vegetables (6.21 servings/1000kcal), and legumes (2.40 servings/1000kcal) were above the recommendation, while that of calcium (627.85mg), iron (21.21mg), folate (531.52 µg), and omega-3 (0.80g) were below the recommended intakes. Consumption of ultra-processed foods was low among the respondents, with an average consumption of 14% of the total energy consumption.

Further, the respondents were categorized into those who had achieved the recommended intakes and those who had not met the recommendations as shown in Table 4.21. Majority of the respondents met the requirements for the servings of fruits (79.4%) and legumes (82.2%). Only a small proportion did not meet the requirements for fruits (20.6%) and legumes (17.7%), as all respondents achieved the recommended servings for vegetables.

Table 0.19: Consumption of IQDAG Components

	Quantities that Met Requirement	
	Frequency (n)	**Percent (%)**
Servings per 1000kcal		
Fresh Fruits	197	79.4
Vegetables	248	100
Legumes	204	82.2
Nutrients (Amount per day)		
Fibre (g)	89	35.9
Omega-3 (mg)	40	16.1
Iron (mg)	48	19.4
Calcium (mg)	49	19.8
Folate (µg)	84	33.9

Fiber intake was consistent with vegetable and fruit intake, accounting for the highest intake among the five nutrients. Over a third (35.9%) of the respondents had achieved the requirement for fiber intake while 64.1% did not meet the requirement. However, most respondents did not meet the requirement for iron, omega-3, calcium, and folate. Only 16.1%, 19.4%, and 19.8% met the requirement for omega-3, iron, and calcium, respectively. More than 80% of the respondents studied did not meet the requirement for omega-3 (83.9%), iron (80.6%), and calcium (80.2%). A higher proportion of the respondents (33.9%)) met the requirement for folate compared to the other three nutrients.

For each respondent, the scores of each IQDAG component were summed up to generate the overall diet quality scores, which were categorized as shown in Table 4.22. The results of the respondents' diet quality scores indicate that most had moderate diet

quality (53.4%). Only 9.2% of the respondents had good diet quality, while 36.3% recorded poor diet quality.

Table 0.20: Respondents' Diet Quality

Diet Quality	Scoring Criteria	Frequency(n)	Percent (%)
Poor	0-50	91	36.3
Moderate	51-80	134	53.4
Good	81-100	23	9.2
Total		**248**	**100**

4.7 Association Between Diet Quality and Other Variables

To achieve the study's main objective, statistical tests were conducted to determine whether there were associations between the variables examined and diet quality. Bivariate analysis was conducted for all variables and diet quality as shown in Table 4.21. Among the maternal characteristics examined, a statistically significant association was observed for education level, employment status, parity, pregnancy stage, and services received during ANC visits, each at a significance of p=0.000. Consumption of homemade food (p=0.002) and fast foods (p=0.000) were the lifestyle factors that had a statistically significant association with diet quality. A statistically significant association was also evident between nutrition literacy and diet quality (p=0.000).

Table 0.21: Chi-square Bivariate Analysis of Determinants of Diet Quality

Variable		Diet Quality			Chi-square values (χ2/df/P value at 0.05)
	Category	Good n= 23 n	Poor n=225 n	Total n (%)	
Socio-demographic characteristics					
**Age	20 years and below	1	7	1.2	x2=2.370
	21 and above year	22	218	98.8	df=1 p = 0.147
**Marital status	Single	2	42	17.7	x2=1.195
	Married	21	183	82.3	df = 1 p = 0.320
**Education level	Primary and below	22	66	64.5	x2=124.309
	Secondary Level and above	1	159	35.5	df=1 **p=0.000**
**Employment status	Employed	21	77	40.7	x2=26.183
	Unemployed	2	144	59.3	df=1 **p=0.000**
Obstetric and ANC					
**Parity	Two and below	1	172	75	x2=276.022
	Three and above	22	40	25	df=1 **p=0.000**
**Pregnancy stage	1&2 trimester	0	199	81	X2=0.003
	Third trimester	23	26	19	df=1 **p=0.000**
Services received	Yes	18	162	23.8	x2=130.933
	No	5	63	76.2	df=2 **p=0.000**
Food security					
**Food security scores	Food secure	1	14	6	x2=0.684
	Food insecure	22	211	94	df=1 p=0.510
Lifestyle factors					
Physical Activity	Moderately	18	206	70.2	
	Others	3	65	29.8	
**Alcohol consumption	Yes	2	14	6.5	x2=1.769
	No	21	211	93.5	df=1 p=0.760
**Consumption of Home-made food	7 days per week	23	0	93.5	X2=8.96 **
	Less than 7 days per	0	225	6.5	df=1 **p=0.020**
**Consumption of fast food	0 days per week	22	200		X2=28.975
	One or more days per week	1	25		df=1 **p=0.000**
Nutrition literacy					
**Nutrition literacy	Poor	0	94	90.8	x2=218.814
	Good	23	131	9.2	df=1 **p=0.000**

** Fisher's Exact Test applied

Multivariate analysis was also done to establish relationships between diet quality and the determinants examined. The variables with statistically significant associations are shown in Table 4.22. Results of the regression analysis mirror those of the bivariate analysis, indicating statistically significant associations between diet quality and employment status (p=0.016), receiving ANC services (p=0.026), consumption of fast foods, (p=0.001) and nutrition literacy (p=0.012). Using a binary logistic regression model, the study found that good diet quality was more likely among pregnant women who received ANC services, those who were employed, did not consume fast food and those with good nutrition literacy.

Table 0.22: Multivariate Analysis of Determinants of Diet Quality

	B	**S.E.**	**Df**	**p-value**	**Exp(B)**	**95.0% C.I. for EXP(B)**	
						Lower	**Upper**
Did not receive Other ANC services					Ref		
Received other ANC services	1.078	0.485	1	**0.026**	2.937	1.135	7.602
Unemployed					Ref		
Employed	1.045	0.436	1	**0.016**	2.845	1.211	6.683
No consumption of fast food					Ref		
Consumption fast food	4.846	1.421	1	**0.001**	0.821	2.134	8.567
Poor nutrition literacy					Ref		
Good nutrition Literacy	1.333	0.529	1	**0.012**	3.794	1.345	10.705
Constant	-1.192	0.326	1	0	0.304		

Significant P<0.05

CHAPTER 5: DISCUSSIONS

5.1 Introduction

This study investigated the diet quality of pregnant mothers attending ANC at St. Mary's Mission Hospital, Nairobi. It also examined various factors to establish their role as determinants of diet quality among this population of women. The factors examined were: nutrition literacy and maternal characteristics, including sociodemographic characteristics, ANC and obstetric factors, and lifestyle factors. The following sections discuss the results in line with the study's objectives.

5.2 Diet Quality among Pregnant Mothers

The study found a variation in the intakes of the food groups versus individual nutrients. The results revealed an abundance of fruit, vegetable, and legume consumption, while the consumption of iron, calcium, omega-3, and folate was low. This trend implies increased consumption in favor of plant foods that are cheaper than animal-based foods, which contain these nutrients in high amounts. This aligns with findings from a Kenyan study that reported consumption of below 50% of the recommended dietary allowance for iron, calcium, and folate among pregnant women (Obwocha et al., 2016). In agreement with the present study findings, these studies indicate an inability to meet nutritional needs during pregnancy. The focus of the IQDAG is the consumption of the food groups fruits, vegetables and legumes, and the nutrients fiber, omega-3, iron, calcium, and folate, which are vital nutritional components during pregnancy. These findings imply a significant deficit in meeting nutritional needs during pregnancy among the mothers interviewed. This is in agreement with previous studies that have indicated similar inadequacies among pregnant mothers. In one Ghanaian study, Bukari et al. (2021) found that only less than half (42.7%) of the pregnant women studied met

the minimum dietary diversity for women. In the study, the food groups with poor consumption were mainly iron, calcium, and folate rich foods, including meats, milk and milk products, and eggs. The same study reported poor consumption of IQDAG food groups like fruits and legumes as less than 30% of their respondents reported consuming foods from either of the food groups.

Contrastingly, Mwaniki et al. (2019) reported considerably high diet quality among mothers in Embu County. Their findings revealed that 72.6% of their sample met the minimum dietary diversity for women, and more than half of their respondents met the RDA for iron intake during pregnancy. However, the Embu study's sample size was 34% smaller than the present study's sample size, which could explain the difference in proportions of mothers with good diet quality. Moreover, the Embu region is a rural agricultural hub with a good climate favorable for growing most crops as well as rearing livestock. Consequently, food items are expected to be more easily accessible and affordable than in Nairobi, where this study was conducted. Consistently, results from Nutrition International's formative research on the ENRICH project demonstrated that pregnant women have in mind increased nutritional needs during pregnancy and aspire to consume healthy diets (Nutrition International, 2020). As demonstrated by the Elgeyo Marakwet study, pregnant women living in an area where animal-source foods, fruits and vegetables are readily available and inexpensive to procure, are likely to consume these foods in plenty.

Moreover, the study found low consumption of ultra-processed food. This signifies a slow adoption of these foods among Nairobi residents. Additionally, there is a higher preference for home cooked meals as observed in the study, which means a lower preference for processed meals. Furthermore, the consumption trend for these processed

foods mirrors the low availability and popularity of these types of foods among poor populations in developing countries as Dolislager et al. (2022) observed.

The study results also imply that pregnant mothers struggle to meet their nutritional needs, particularly iron, folate, calcium, and omega-3. This is similar to a South African study that assessed diet quality using IQDAG, where the researchers recorded poor diet quality as in this study (Van den Berg et al., 2022). They recorded a median intake less than 50% of the recommended daily servings of fruits and legumes and omega-3 intake. While there is a similarity in the results of this study and Van den Berg et al., (2022), the present study recorded median intakes exceeding 50% of the recommended intake. Similarly, higher intakes were recorded for vegetables, folate, and fiber intake (≥50% of recommended intake). The results in the present study also reflect those recorded by Enyew et al. (2023), who found that micronutrient consumption during pregnancy is very low among East African mothers. The low prevalence of micronutrient consumption reported in the East African study mirrors the results on diet quality in this study. Consequently, there is a need for interventions targeting to improve diet quality among pregnant mothers in Kenya.

5.3 Maternal Characteristics as Determinants of Diet Quality

5.3.1 Sociodemographic Characteristics

Of the sociodemographic factors examined, only employment status and education level demonstrated a statistically significant association with diet quality among the population studied (p=0.000). The multivariate analysis found that there was an increased likelihood of good diet quality among employed women (OR = 2.845). Employment brings improved economic status, and the results imply that pregnant mothers of high socioeconomic status were more likely to have good diet quality than

those of low socioeconomic status. As the target population was urban, urbanization could have played a role in the results observed. With urbanization comes an increased availability and accessibility of a variety of dietary options, enabling urban dwellers to improve their diets (de Bruin et al., 2021). Improved dietary diversity with characterized by the consumption of animal-source foods, fruits and vegetables has been observed among urban residents elsewhere in Africa (Casari et al., 2022).

Employment is a significant predictor of dietary habits because it increases an individual's purchasing power, which enables them to afford quality diets. Meeting the dietary diversity threshold of five food groups costs 18% more than meeting three food groups per day in Kenya (Korir et al., 2023). This implies that the ability to consume quality diets is determined by an individual's purchasing power. Studies in LMICs agree that increased purchasing power is positively associated with improved diet. In five countries across Asia, Bai et al. (2024) found that increased household income improves consumption of protein and micronutrient-rich foods. Employed individuals have a steady source of income, and tend to assign much importance to the consumption of healthy diets as evidenced by Maina and Kornher (2024) who found that Kenyans of high economic status are motivated by health and weight concerns to consume healthy diets. Economically well-off households in African cities are more likely to consume foods from a variety of food groups (Mackay et al., 2023). This is consistent with Morseth et al. (2017) also found an association between socioeconomic status indicators, including income and diversification of diets in Algeria. At the same time, the study found high consumption of micronutrient-rich cereals and pulses from women who were housewives and had low education status.

Nevertheless, other studies have shown contrasting results. For instance, De Assumpção et al. (2016) found that highly educated individuals in Brazil have a high consumption of nutrient dense foods such as fruits, vegetables, and whole grains. Another study in the United States recorded a positive association between diet quality and education level (McCullough et al., 2022). These studies indicate the contrast between dietary behaviors in developed and developing countries. While those of high education status opt to move away from western diets in developed countries, those of the same education status move towards the western diets that are highly priced (Njagi, 2017; Taylor et al., 2019).

Still, the findings of the present study agree with those of Korir et al. (2023), which showed an association between increased dietary diversity and household income in Nairobi, Kenya. This is supported by Vila-Real et al. (2022), who established that people of high socioeconomic status in urban areas often consume animal-source foods more than those of low socioeconomic status. Consistently, Cardoso et al. (2020) discovered that even individuals with low education levels have acquired positive attitudes towards healthy eating. This could also contribute to the good diet quality observed among mothers with low education levels.

5.3.2 Obstetric and ANC Factors

The study found significant associations between diet quality and parity, and services received during ANC visits. Respondents who had received a service during clinic visits were more likely to have good diet quality (OR=2.937). These results imply that mothers who attended more clinic visits and interacted with healthcare workers during service delivery were more likely to be educated about healthy diets than those who did not. Mothers with more children are likely to have attended antenatal clinic many times

and received health services during the visits, as majority of pregnant mothers in Kenya attend at least four antenatal clinic visits (KNBS & ICF, 2023). In Kenya, maternal health clinics usually offer nutrition education and counselling as part of integrated services provided to all mothers seeking antenatal care. Healthcare providers in hospitals often arrange nutrition education sessions with all mothers attending clinic and insist that mothers attend nutrition counselling sessions (Kihagi et al., 2024). The study results reflect the effect of these activities, showing that attending antenatal clinics equips mothers with knowledge and skills to embrace good nutrition practices.

Studies have found that targeted nutrition education as offered during antenatal clinics significantly influences nutrition knowledge and improves dietary practices among pregnant mothers. According to Teweldemedhin et al. (2021) found that pregnancy specific nutrition education by healthcare workers improved nutrition knowledge and contributed to improved dietary practices. Similarly, pregnant mothers' nutrient intake is improved by nutrition counselling. A review of evidence by Dewidar et al. (2023) found that pregnant mothers improve their intake of specific nutrients, including protein and carbohydrate intake and promotes positive breastfeeding behavior. Interventions targeting behavior change among during pregnancy have also demonstrated that educating mothers on best nutrition practices significantly improves their dietary behavior. Goodarzi-Khoigani et al. (2018) revealed that nutrition education influences pregnant mothers' perception of healthy eating and enhances adoption of healthy food choices including consumption of meat, dairy, and vegetables.

5.3.3 Food Security

Interestingly, the study results found no significant association between food security and diet quality. However, the study realized very high levels of food insecurity as food

insecurity was experienced by 94% of the study participants. Low food security status has been persistent in Kenya, and this is expected to be reflected in Nairobi, the country's largest city. According to Lokuruka (2020), cities in Kenya are home to 20% of the country's population that is most affected by food insecurity. Urban residents, especially those living in Nairobi are faced with food affordability challenges as food is produced in the rural parts of the country and transported to be sold in the cities and towns. Consequently, the food is more expensive, and mothers of low socioeconomic status may find themselves unable to afford to meet their dietary needs.

Onyango et al. (2023), who surveyed households in Nairobi, recorded high levels of food insecurity (74%) among Nairobi city dwellers. In another study, Wanyama et al. (2019) found that food insecurity status among Nairobi slum dwellers was at 87%. Although high food insecurity in Nairobi was anticipated, the present study recorded very high levels of food insecurity. The low employment status among the study population may contribute to this high food insecurity. Majority (81.1%) of the mothers interviewed were either unemployed (housewife) or self-employed. Moreover, the COVID-19 pandemic exerted strong effects on individuals' occupation status, income levels, and purchasing power. Consequently, the food affordability went down especially among urban residents. This was demonstrated by Picchioni et al. (2022), who reported a consistent upward climb of food insecurity following the pandemic in LMICs, including Kenya.

The results of this study align with those realized in a study that involved lactating mothers (Rajabzadeh-Dehkordi et al., 2023). While using both dietary diversity score and diet quality index (DQI-I) as indicators for diet quality, the authors found no statistically significant relationship between household food security status and either

of the diet quality indicators. In another study (Walton et al., 2019), dietary diversity score of women did not significantly correlate with food security status. Contrary to the present study's findings, Singh et al. (2020) demonstrated that high food insecurity predicts low dietary diversity among urban women in Nepal. Likewise, Onyango et al. (2023) recorded that households experiencing severe food insecurity were more likely to experience poor dietary diversity. These results notwithstanding, it is imperative to note that these studies investigated dietary diversity rather than diet quality.

5.3.4 Lifestyle Factors

The study observed low consumption of fast-food among the respondents. This is awareness about its unhealthy nature. Moreover, due to the covid-19 pandemic and increased awareness on the health effects of fast foods consumption, Nairobi has experienced a reduction in unhealthy eating behavior (Mbijiwe et al., 2021). Respondents who consumed fast food were less likely to have good diet quality (OR=0.821). These results are in agreement with Barnes et al. (2016), who used the healthy eating index (HEI) as an indicator of diet quality. In their investigation of fast foods consumption patterns, they found that frequent consumption of these high calorie high sugar foods was associated with poor diet quality scores.

Similar findings were realized in another study, which reported low HEI scores among fast foods American consumers (Hoy et al., 2022). Similarly, lower diet quality, measured by food frequency questionnaire, was recorded in Saudi Arabia among adolescents who frequently consume fast foods (Mumena et al., 2022). While not much in the area of fast foods consumption and diet quality has been done in Kenya, the results show that fast foods consumption is linked to poor diet quality. Furthermore, the

consistency with other studies despite the different diet quality instruments used, shows high strength of the association between fast foods consumption and diet quality.

This study observed high consumption of home-made food. The high cost of living observed in Kenya post-Covid-19 (Solymári et al., 2022) could have contributed to the high number of respondents who always eat food made at home. Women, as well as people of low socioeconomic status are less likely to consume food away from home (Landais et al., 2023). Consequently, the high consumption of food away from home could be due to the high number of mothers who were housewives and the low education status observed in the study. Results on the consumption of home-made food are also a viable reason for the low intake of fast foods. Women who do not stay at home may have preferred to carry packed food items due to the high expense associated with buying meals away from home (Chweya, 2023). Further, consumption of home-made food was positively correlated with diet quality.

The study did not find a statistically significant association between diet quality and consumption of home-made food. The high proportion of respondents who reported consuming homemade food daily could have contributed to this finding. Studies have demonstrated that the likelihood of dietary inadequacy is high among individuals who frequently consume food away from home (Astbury et al., 2019; Matsumoto et al., 2021). However, the number of days a week that home cooked food is consumed matters in this associations. For instance, findings from a cohort study (Mills et al., 2017) reported that consumption of home cooked meals five times a week was associated with increased intake of fruits and vegetables compared to those who consumed home cooked meals less frequently. Similarly, the findings agree with Wolfson et al. (2020), who found that cooking at home 7 times a week was associated

with increased HEI score. In the present study, all respondents consumed food made at home more than four times a week. Failure to obtain data on less frequent consumption of home cooked food could explain the findings.

As expected, physical activity among the pregnant mothers who were interviewed ranged from low to moderate. With pregnancy, most mothers reduce their activity level as observed in the study results. Consistently, there was no association between physical activity status and diet quality. Among the non-pregnant population, increases in physical activity level has been observed to increase diet quality of individuals when carried on for a long period of time (Watanabe et al., 2022; Park et al., 2020; Thorpe et al., 2019). Still, there are cross-sectional studies that have found associations between physical activity and diet quality during pregnancy. Deierlein et al. (2021) found a positive association between meeting physical activity guidelines and achieving good diet quality in pregnancy. Similarly, Ehrhardt et al. (2022) found that physical activity during pregnancy positively influenced the HEI scores of mothers.

While these two studies demonstrate contradicting results with those from the present study, it is vital to note the differences in the study methods. While Deierlein et al. (2021) used IPAQ to measure physical activity, the researchers used meeting guidelines as an indicator of physical activity level, which were tailored to the American population. At the same time, Ehrhardt et al. (2022) used the Pregnancy Physical Activity Questionnaire (PPAQ) to determine physical activity level. Consequently, the present study may not have correctly assessed the physical activity status with a specificity to pregnant mothers. Moreover, the differences in trends of physical activity in Kenya and the United States could also contribute to the differences in the results.

5.4 Nutrition Literacy

High nutrition literacy was observed among the study participants, as the majority had either moderate or good nutrition literacy. The study also found a statistically significant association between nutrition literacy and diet quality (OR=3.79). Nutrition education programs have been found to positively influence nutrition behaviour change (Sankavaram et al., 2022; Hejazi et al., 2023). As the study was conducted among mothers attending antenatal clinics regularly, the high nutrition literacy could be attributed to the availability of nutrition education and counselling at the medical facility. Additionally, the increased availability of nutrition literature in mass media owing to the government's efforts to increase nutrition knowledge among pregnant mothers could also play a role in the high proportion of participants with high scores of nutrition literacy (Klassen et al., 2018; Pancer et al., 2021).

The study used the Nutrition Literacy Assessment Instrument (NLit), which has been considered as an appropriate tool for measuring nutrition literacy (Gibbs et al., 2018). The four subscales included in the tool measure all three aspects of nutrition literacy: functional, interactive, and critical literacy. The study findings imply that understanding nutrition aspects and having the skills to apply them in daily life is significant in the making of nutrition decisions. Consequently, individuals with good nutrition literacy choose to practice dietary patterns that provide their bodies with the appropriate nutrients for achievement and maintenance of a good nutritional status. While fairly a young concept in nutrition, the trend between nutrition literacy and dietary patterns has been established in other works of research. In Taylor et al. (2019), nutrition literacy was observed to influence the dietary patterns of adults in the United States. Like in the present study, the findings indicated that persons with high nutrition literacy scores

were more likely to adhere to Mediterranean diets, while those with low scores leaned towards Western diets.

Likewise, Joulaei et al. (2018) found that the diet quality of adolescents in Iran was associated with their level of nutrition literacy. Their results indicated a positive relationship between literacy and achievement of adequacy in the Revised Children's Diet Quality Index such as energy balance, dairy intake, and fat intake. Similarly, Tell et al. (2023) found that the likelihood of engaging in poor dietary habits reduced with increased nutrition literacy, especially functional aspects of nutrition literacy. Evidence on the role of nutrition literacy in determining dietary patterns is scarce. However, other studies that have examined nutrition literacy have investigated the association between nutrition literacy and nutritional status. For instance, Li et al. (2022) established a negative relationship between nutrition literacy and overnutrition. Some studies have used Nlit to assess associations between dietary patterns and nutrition literacy (Taylor et al., 2019), while others have adopted other tools that examine all three aspects of nutrition literacy (Joulaei et al., 2018; Li et al. 2022; Tell et al., 2023). Nevertheless, similarities in the findings from these studies reflect the significance of nutrition literacy as a predictor of nutrition outcomes, including diet quality, as observed in the present study.

CHAPTER 6: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study found that pregnant women attending ANC at St. Mary's Mission Hospital had moderate diet quality with an abundance of fruit, vegetable, and legume consumption, while the consumption of iron, calcium, omega-3, and folate was low. There was also low consumption of ultra-processed food and fast foods and a high frequency of consuming homemade foods. The pregnant women assessed had good nutrition literacy and knowledge about the various food groups and energy sources in food. There was significant association between nutrition literacy and diet quality among pregnant mothers, as nutrition literacy was the variable with the highest odds of predicting diet quality.

There were significant associations between diet quality, employment status and receiving health services during ANC visits. A positive association was observed between employment status and diet quality, implying that women with steady employment were more likely to afford foods from various food groups and, hence, more likely to meet their dietary needs. A low likelihood of achieving good diet quality was associated with fast food consumption. There was also significant association between good diet quality among pregnant women and having received health services during ANC clinics, indicating the relevance of nutrition education and counselling in influencing food consumption behavior. This emphasizes the importance of antenatal clinics in Kenya for promoting healthy dietary practices among pregnant mothers through frequent interactions with healthcare workers.

6.2 Recommendations

The following are recommendations stemming from the study findings.

i. Pregnant women who obtain services during ANC visits demonstrate good diet quality. This underscores the role of healthcare workers in nutrition education at the hospitals. Healthcare workers at the hospital should ensure continuous nutrition education and counselling during antenatal clinic visits for all pregnant women.

ii. The study found that nutrition literacy strongly determines diet quality. Healthcare workers at the antenatal clinic should aim to equip pregnant women with the knowledge and skills necessary to improve nutrition literacy among pregnant women to achieve good diet quality among these women.

iii. Pregnant mothers who frequently consume fast food are less likely to achieve good nutrition. Nutrition sensitization and education should discourage the consumption of fast foods and ultra-processed foods.

iv. Alongside the improvement of nutrition literacy, interventions ought to focus on improving women's purchasing power to enable them to afford varied diets necessary for the achievement of good diet quality.

v. Further research should particularly examine diet quality using the varied diet quality indices to establish whether the trends recorded in this study are replicated among various pregnant populations in Kenya.

REFERENCES

Adekanle, D. A., Ojofeitimi, E. O., Fatusi, A. O., & Okanlawon, F. A. (2015). Food choices and dietary intake of pregnant women in Osogbo, Nigeria. *Annals of Nutrition and Metabolism, 6*7(3), 167-176. https://doi.org/10.1159/00043346 .

Akter, R., Sugino, H., Akhter, N., Brown, C. L., Thilsted, S. H., & Yagi, N. (2021). Micronutrient adequacy in the diet of reproductive-aged adolescent girls and adult women in rural Bangladesh. *Nutrients,* 13(2), 337. https://doi.org/10.3390/nu13020337

Ali, F., Thaver, I., & Khan, S. A. (2014). Assessment of dietary diversity and nutritional status of pregnant women in Islamabad, Pakistan. *Journal of Ayub Medical College Abbottabad*, *26*(4), 506-9.

Al Tell, M., Natour, N., Alshawish, E., & Badrasawi, M. (2023). The relationship between nutrition literacy and nutrition information seeking attitudes and healthy eating patterns among a group of Palestinians. *BMC Public Health*, 23(1), 165. https://doi.org/10.1186/s12889-023-15121-z

Alkerwi A. (2014). Diet quality concept. *Nutrition*, 30(6), 613–618. https://doi.org/10.1016/j.nut.2013.10.001

Astbury, C., Penney, T. L., & Adams, J. (2019). Home-prepared food, dietary quality, and sociodemographic factors: A cross-sectional analysis of the UK National Diet and nutrition survey 2008-16. *The International Journal of Behavioural Nutrition and Physical Activity*, 16(1), 82. https://doi.org/10.1186/s12966-019-0846-x

Bai, Y., Zeng, X., Fu, C., & Zhang, L. (2024). Off-farm employment, agriculture production activities, and household dietary diversity in environmentally and

economically vulnerable areas of Asia, *Journal of Integrative Agriculture, 23* (2), 359-373, https://doi.org/10.1016/j.jia.2023.11.016

Barnes, T. L., French, S. A., Mitchell, N. R., & Wolfson, J. (2016). Fast-food consumption, diet quality and body weight: Cross-sectional and prospective associations in a community sample of working adults. Public health nutrition, 19(5), 885–892. https://doi.org/10.1017/S1368980015001871

Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., Ezzati, M., Grantham-McGregor, S., Katz, J., Martorell, R., Uauy, R., & Maternal and Child Nutrition Study Group (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*, 382(9890), 427–451. https://doi.org/10.1016/S0140-6736(13)60937-X

Brenes, J. C., Gómez, G., Quesada, D., Kovalskys, I., Rigotti, A., Cortés, L. Y., Yépez García, M. C., Liria-Domínguez, R., Herrera-Cuenca, M., Guajardo, V., Fisberg, R. M., Leme, A., Ferrari, G., Fisberg, M., & On Behalf of the Elans Study Group (2021). Alcohol contribution to total energy intake and its association with nutritional status and diet quality in Eight Latina American Countries. *International Journal of Environmental Research and Public Health,* 18(24), 13130. https://doi.org/10.3390/ijerph182413130

Broerse, J., & Nangulu, A. K. (2017). Food beliefs and practices among the Kalenjin pregnant women in rural Uasin Gishu County, Kenya. *Journal of Ethnobiology and Ethnomedicine, 13*. https://doi.org/10.1186/s13002-017-0157-8

Bukari, M., Saaka, M., Masahudu, A., Ali, Z., Abubakari, A. L., Danquah, L. O., Abdulai, A. N., & Abizari, A. R. (2021). Household factors and gestational age

predict diet quality of pregnant women. *Maternal & Child Nutrition*, 17(3), e13145. https://doi.org/10.1111/mcn.13145

Casari, S., Paola, M. D., Banci, E., Diallo, S., Scarallo, L., Renzo, S., Gori, A., Renzi, S., Paci, M., Pecht, T., Derra, K., Kaboré, B., Tinto, H., Cavalieri, D., & Lionetti, P. (2022). Changing dietary habits: The impact of urbanization and rising socio-economic status in families from Burkina Faso in Sub-Saharan Africa. *Nutrients, 14*(9). https://doi.org/10.3390/nu14091782

Chege, P. M., Kuria, E., & Kimiywe, J. (2015). Influence of culture on dietary practices of children under five years among Maasai pastoralists in Kajiado, Kenya. *International Journal of Behavioral Nutrition and Physical Activity, 12*(1), 9. https://doi.org/10.1186/s12966-015-0177-3 .

Chweya, E. (2023, October 23). Eateries *count losses as middle class Kenyans turn to packed lunch to survive harsh cost of living*. Citizen Digital. https://www.citizen.digital/news/eateries-count-losses-as-middle-class-kenyans-turn-to-packed-lunch-to-survive-harsh-cost-of-living-n329852. Retrieved January 23, 2024.

Coates J, Swindale A, & Bilinsky P. (2007). *Household food insecurity access scale (HFIAS) for measurement of food access: Indicator guide*. Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development. https://www.fantaproject.org/monitoring-and-evaluation/household-food-insecurity-access-scale-hfias

Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J. F., Oja, P. (2003). International physical activity questionnaire : 12-country reliability and validity.

Medicine and Science in Sports and Exercise, 35(8), 1381-1395. https://doi.org/10.1249/01.mss.0000078924.61453.fb

Crivellenti, L. C., Zuccolotto, D. C. C., & Sartorelli, D. S. (2018). Diet quality of pregnant women: The impact of an educational program during prenatal care. *Journal of Human Nutrition and Dietetics, 31*(4), 441-450. https://doi.org/10.1111/jhn.12529

Crivellenti, L. C., Zuccolotto, D., & Sartorelli, D. S. (2018). Development of a diet quality index adapted for pregnant women. *Revista de Saude Publica*, 52, 59. https://doi.org/10.11606/s1518-8787.2018052000184

Cummings, J. R., Gearhardt, A. N., Ray, L. A., Choi, A. K., & Tomiyama, A. J. (2020). Experimental and observational studies on alcohol use and dietary intake: A systematic review. *Obesity reviews: An Official Journal of the International Association for the Study of Obesity*, 21(2), e12950. https://doi.org/10.1111/obr.12950

Dalwood, P., Marshall, S., Burrows, T. L., McIntosh, A., & Collins, C. E. (2020). Diet quality indices and their associations with health-related outcomes in children and adolescents: An updated systematic review. *Nutrition Journal*, 19(1), 118. https://doi.org/10.1186/s12937-020-00632-x

Darnton-Hill, I., & Mkparu, U. C. (2015). Micronutrients in pregnancy in low- and middle-income countries. *Nutrients, 7*(3), 1744-1768. https://doi.org/10.3390/nu7031744

De Assumpção, D., Domene, S. M. A., Fisberg, R. M., & Canesqui, A. M. (2016). Barriers to healthy eating among adults: A qualitative study in São Paulo,

Brazil. *Journal of Nutrition Education and Behavior, 48*(9), 658-667. https://doi.org/10.1016/j.jneb.2016.05.004

Assumpção, D. D., Domene, S. M. Á., Fisberg, R. M., & Barros, M. B. D. A. (2016). Social and demographic inequalities in diet quality in a population-based study. *Revista de Nutrição*, *29*, 151-162. https://doi.org/10.1590/1678-98652016000200001

de Bruin, S., Dengerink, J., & van Vliet, J. (2021). Urbanisation as driver of food system transformation and opportunities for rural livelihoods. *Food Security, 13*(4), 781–798. https://doi.org/10.1007/s12571-021-01182-8

Deierlein, A. L., Ghassabian, A., Kahn, L. G., Afanasyeva, Y., Mehta-Lee, S. S., Brubaker, S. G., & Trasande, L. (2021). Dietary quality and sociodemographic and health behavior characteristics among pregnant women participating in the New York University children's health and environment study. *Frontiers in Nutrition*, 8, 639425. https://doi.org/10.3389/fnut.2021.639425

Desyibelew, H. D., & Dadi, A. F. (2019). Burden and determinants of malnutrition among pregnant women in Africa: A systematic review and meta-analysis. *PloS ONE*, 14(9), e0221712. https://doi.org/10.1371/journal.pone.0221712

Dewidar, O., John, J., Baqar, A., Madani, M. T., Saad, A., Riddle, A., Ota, E., Kung'u, J. K., Arabi, M., Raut, M. K., Klobodu, S. S., Rowe, S., Hatchard, J., Busch-Hallen, J., Jalal, C., Wuehler, S., & Welch, V. (2023). Effectiveness of nutrition counseling for pregnant women in low- and middle-income countries to improve maternal and infant behavioral, nutritional, and health outcomes: A systematic review. *Campbell Systematic Reviews*, 19(4), e1361. https://doi.org/10.1002/cl2.1361

Dicken, S. J., & Batterham, R. L. (2021). The role of diet quality in mediating the association between ultra-processed food intake, obesity and health-related outcomes: A review of prospective cohort studies. *Nutrients*, 14(1), 23. https://doi.org/10.3390/nu14010023

Dolislager, M., Liverpool-Tasie, L.S., Mason, N.M., Reardon, T., Tschirley, D. (2022). Consumption of healthy and unhealthy foods by the African poor: Evidence from Nigeria, Tanzania, and Uganda. *Agricultural Economics*, 53(6), 870-894. https://doi.org/10.1111/agec.12738

Dunneram, Y., & Jeewon, R. (2013). A scientific assessment of sociodemographic factors, physical activity level, and nutritional knowledge as determinants of dietary quality among Indo-Mauritian women. *Journal of Nutrition and Metabolism*, 572132. https://doi.org/10.1155/2013/572132

Ehrhardt, C., Deibert, C., Flöck, A., Merz, W. M., Gembruch, U., Bockler, A., Dötsch, J., Joisten, C., & Ferrari, N. (2022). Impact of diet quality during pregnancy on gestational weight gain and selected adipokines: Results of a German cross-sectional study. *Nutrients*, 14(7), 1515. https://doi.org/10.3390/nu14071515

Enyew, E.B., Tareke, A.A., Dubale, A.T., Fetene, S.M., Ahmed, M.H., Feyisa, M.S., et al. (2023). Micronutrient intake and associated factors among pregnant women in East Africa: Multilevel logistic regression analysis. *PLoS ONE* 18(4): e0281427. https://doi.org/10.1371/journal.pone.0281427

Fanelli, S. M., Jonnalagadda, S. S., Pisegna, J. L., Kelly, O. J., Krok-Schoen, J. L., & Taylor, C. A. (2020). Poorer diet quality observed among us adults with a greater number of clinical chronic disease risk factors. *Journal of Primary Care & Community Health*. https://doi.org/10.1177/2150132720945898

FAO/Government of Kenya. (2018). Kenya food composition tables. http://www.fao.org/3/I9120EN/i9120en.pdf

Farhud, D. D. (2015). Impact of lifestyle on health. Iranian Journal of Public Health, 44(11), 1442–1444. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4703222/

Fowles, E. R., Bryant, M., Kim, S. H., & Walker, L. O. (2012). Predictors of dietary quality in low-income pregnant women: A path analysis. *Nursing Research, 61*(5), 286-294. https://doi.org/10.1097/NNR.0b013e318262a5d9

Fuhrman J. (2018). The hidden dangers of fast and processed food. *American Journal of Lifestyle Medicine*, 12(5), 375–381. https://doi.org/10.1177/1559827618766483

Gebremedhin, S., Enquselassie, F., Umeta, M., & Alemayehu, T. (2018). Maternal nutritional status, food intake and pregnancy outcomes: A study in an Ethiopian rural community. *Paediatrics and International Child Health, 38*(2), 95-101. https://doi.org/10.1080/20469047.2017.1398378

Gernand, A. D., Schulze, K. J., Stewart, C. P., West, K. P., Jr, & Christian, P. (2016). Micronutrient deficiencies in pregnancy worldwide: Health effects and prevention. *Nature Reviews. Endocrinology, 12*(5), 274–289. https://doi.org/10.1038/nrendo.2016.37

Gernand, A. D., Schulze, K. J., Stewart, C. P., West, K. P., Jr, & Christian, P. (2016). Micronutrient deficiencies in pregnancy worldwide: Health effects and prevention. *Nature Reviews. Endocrinology*, 12(5), 274–289. https://doi.org/10.1038/nrendo.2016.37

Gibbs, H. D., Ellerbeck, E. F., Gajewski, B., Zhang, C., & Sullivan, D. K. (2018). The nutrition literacy assessment instrument is a valid and reliable measure of nutrition literacy in adults with chronic disease. *Journal of Nutrition Education and Behaviour*, 50(3), 247–257.e1. https://doi.org/10.1016/j.jneb.2017.10.008

Gibbs, H. D., Kennett, A. R., Kerling, E. H., Yu, Q., Gajewski, B., Ptomey, L. T., & Sullivan, D. K. (2016). Assessing the nutrition literacy of parents and its relationship with child diet quality. *Journal of Nutrition Education and Behaviour*, 48(7), 505–509. https://doi.org/10.1016/j.jneb.2016.04.006

Gil, Á., Martinez de Victoria, E., & Olza, J. (2015). Indicators for the evaluation of diet quality. *Nutricion hospitalaria*, 31(Suppl 3), 128–144. https://doi.org/10.3305/nh.2015.31.sup3.8761

Gitatui, M., Kimani, S., Muniu, S., & Okube, O. (2019). Determinants of harmful use of alcohol among urban slum dwelling adults in Kenya. *African Health Sciences, 19*(4), 2906–2925. https://doi.org/10.4314/ahs.v19i4.12

Gokhale, D., & Rao, S. (2022). Socioeconomic and sociodemographic determinants of diet diversity among rural pregnant women from Pune, India. *BMC Nutrition*, 8(1), 54. https://doi.org/10.1186/s40795-022-00547-2

Goodarzi-Khoigani, M., Baghiani Moghadam, M. H., Nadjarzadeh, A., Mardanian, F., Fallahzadeh, H., & Mazloomy-Mahmoodabad, S. (2018). Impact of nutrition education in improving dietary pattern during pregnancy based on Pender's Health Promotion Model: A randomized clinical trial. Iranian *Journal of Nursing and Midwifery Research*, 23(1), 18–25. https://doi.org/10.4103/ijnmr.IJNMR_198_16

Government of Kenya & Nairobi City County. (2020, February). Nairobi County Smart Survey. http://www.nutritionhealth.or.ke/wp-content/uploads/SMART%20Survey%20Reports/Nairobi%20SMART%20survey%20Final%20-%20Feb%202020.pdf

Harika, R., Faber, M., Samuel, F., Kimiywe, J., Mulugeta, A., & Eilander, A. (2017). Micronutrient status and dietary intake of iron, vitamin a, iodine, folate and zinc in women of reproductive age and pregnant women in Ethiopia, Kenya, Nigeria and South Africa: A systematic review of data from 2005 to 2015. *Nutrients, 9*(10). https://doi.org/10.3390/nu9101096

Hejazi, J., Aminzare, M., Ayatollahi, Y., Vakili, M. M., Hassanzadazar, H., & Rahimlou, M. (2023). Effect of a comprehensive nutrition education program on nutritional behavior and food security of female-headed households who receive welfare support in Zanjan Province, Iran. *BMC Public Health*, 23(1), 1512. https://doi.org/10.1186/s12889-023-16478-x

Holdsworth, M., Pradeilles, R., Tandoh, A., Green, M., Wanjohi, M., Zotor, F., Asiki, G., Klomegah, S., Abdul-Haq, Z., Osei-Kwasi, H., Akparibo, R., Bricas, N., Auma, C., Griffiths, P., & Laar, A. (2020). Unhealthy eating practices of city-dwelling Africans in deprived neighbourhoods: Evidence for policy action from Ghana and Kenya. *Global Food Security*, 26, 100452. https://doi.org/10.1016/j.gfs.2020.100452

Hossain, B., Mani, K. K., Rahman, A., & Hasan, M. (2020). Association between maternal socio-demographic factors and nutritional status of children under five in Bangladesh. *Children, 7*(3), 25. https://doi.org/10.3390/children7030025

Hoy, M. K., Murayi, T., & Moshfegh, A. J. (2022). Diet quality of frequent fast-food consumers on a non-fast food intake day is similar to a day with fast food, what we eat in America, NHANES 2013-2016. *Journal of the Academy of Nutrition and Dietetics*, 122(7), 1317–1325. https://doi.org/10.1016/j.jand.2022.02.007

Hubner, S., Boron, J. B., & Koehler, K. (2021). The effects of exercise on appetite in older adults: A systematic review and meta-analysis. *Frontiers in Nutrition*, 8, 734267. https://doi.org/10.3389/fnut.2021.734267

Institute of Medicine. (2005). *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids*. https://doi.org/10.17226/10490.

Jiang, W., Meng, X., Hou, W., Wu, X., Wang, Y., Wang, M., Chu, X., Wang, P., Sun, C., Han, T., & Li, Y. (2021). Impact of overall diet quality on association between alcohol consumption and risk of hypertension: Evidence from two national surveys with multiple ethnics. *European Journal of Clinical Nutrition*, 75(1), 112–122. https://doi.org/10.1038/s41430-020-00708-1

John, J. R., Osei-Kwasi, H. A., & Asante, M. (2021). Determinants of dietary practices among pregnant women in Tanzania: A cross-sectional study. *BMC Pregnancy and Childbirth, 21*(1), 456. https://doi.org/10.1186/s12884-021-03931-1

John, S., Paulo, H., Hancy, A., Sanga, A. Noor, R., Lankoande, F., Masumo, R., Leyna, G., Bridge, G. & Bedi, R. (2021). Demographic and socioeconomic variations in diet quality among pregnant women in Mbeya, Tanzania. https://www.researchgate.net/publication/353252480_Demographic_and_Soci

oeconomic_Variations_in_Diet_Quality_Among_Pregnant_Women_in_Mbeya_Tanzania

Joo, J., Williamson, S.A., Vazquez, A.I., Fernandez, J.A., & Bray, M.S. (2019). The influence of 15-week exercise training on dietary patterns among young adults. *International Journal of Obesity* 43, 1681–1690 (2019). https://doi.org/10.1038/s41366-018-0299-3

Joulaei, H., Keshani, P., & Kaveh, M.H. (2018). Nutrition literacy as a determinant for diet quality amongst young adolescents: A cross sectional study. *Progress in Nutrition,* 20(3), 455-464. https://doi.org/10.23751/pn.v20i3.6705

Kanerva, N., Wachira, L. J., Uusi-Ranta, N., Anono, E. L., Walsh, H. M., Erkkola, M., Ochola, S., Swindell, N., Salmela, J., Vepsäläinen, H., Stratton, G., Onywera, V., & Fogelholm, M. (2023). Wealth and sedentary time are associated with dietary patterns among preadolescents in Nairobi City, Kenya. *Journal of Nutrition Education and Behavior*, 55(5), 322–330. https://doi.org/10.1016/j.jneb.2023.02.001

Kang, M., Park, S. Y., Shvetsov, Y. B., Wilkens, L. R., Marchand, L. L., Boushey, C. J., & Paik, H. Y. (2019). Sex differences in sociodemographic and lifestyle factors associated with diet quality in a multiethnic population. *Nutrition*, 66, 147–152. https://doi.org/10.1016/j.nut.2018.11.022

Karanja, N., Platt, A., Thuita, F., & Kuria, E. (2021). Nutrition literacy and dietary practices among pregnant women in Nairobi, Kenya. *Maternal & Child Nutrition, 17*(2), e13134. https://doi.org/10.1111/mcn.13134

Kariuki, J., & Kiage, B. (2019). Dietary diversity, food insecurity and nutrition status among pregnant women in Nairobi County, Kenya. *Journal of Nutritional*

Health & Food Engineering, 9(2), 62-66. https://doi.org/10.15406/jnhfe.2019.09.00328

Kendagor, A., Gathecha, G., Ntakuka, M. W., Nyakundi, P., Gathere, S., Kiptui, D., Abubakar, H., Ombiro, O., Juma, P., & Ngaruiya, C. (2018). Prevalence and determinants of heavy episodic drinking among adults in Kenya: Analysis of the STEPwise survey, 2015. *BMC Public Health*, 18(Suppl 3), 1216. https://doi.org/10.1186/s12889-018-6057-6

Kennedy, N., Fanou, C., Seghieri, G., & Brouwer, I. D. (2011). *Dietary diversity as a measure of the micronutrient adequacy of women's diets: Results from Bamako, Mali Site, Academy for Educational Development, Washington, DC, USA*. https://www.fantaproject.org/sites/default/files/resources/WDDP_Summary_Report_Jul2011.pdf

Kenya National Bureau of Statistics (KNBS) & ICF. (2023). Kenya Demographic and Health Survey 2022: Volume 1. Nairobi, Kenya. https://dhsprogram.com/pubs/pdf/PR143/PR143.pdf

Kenya National Bureau of Statistics (KNBS). (2013). Kenya national micronutrient survey 2011, First Round. http://www.nutritionhealth.or.ke/wp-content/uploads/Downloads/The%20Kenya%20National%20Micronutrient%20Survey%202011.pdf

Kiboi W., Kimiywe J., & Chege P. (2016). Dietary diversity, nutrient intake and nutritional status among pregnant women in Laikipia County, Kenya. *International Journal of Health Sciences and Research*, 6(4), 378-385. https://www.researchgate.net/publication/305709136_Dietary_Diversity_Nutri

ent_Intake_and_Nutritional_Status_among_Pregnant_Women_in_Laikipia_County_Kenya

Kihagi, G. W., Hansen, L. S., Agure, E., Muok, E. M. O., Mank, I., Danquah, I., & Sorgho, R. (2024). 'Counselling is not just providing information': Perceptions of caregivers and stakeholders on the design of nutrition and health counselling interventions for families with young children in rural Kenya. BMC health services research, 24(1), 597. https://doi.org/10.1186/s12913-024-10872-w. accessed on 23/2/2024

Kim, S., Haines, P. S., Siega-Riz, A. M., & Popkin, B. M. (2003). The Diet Quality Index-International (DQI-I) provides an effective tool for cross-national comparison of diet quality as illustrated by China and the United States. *The Journal of Nutrition,* 133(11), 3476–3484. https://doi.org/10.1093/jn/133.11.3476

Kimiywe, J., & Chege, P. M. (2015). The determinants of dietary diversity and nutrition status among women of reproductive age in Nairobi, Kenya. *African Journal of Food, Agriculture, Nutrition and Development, 15*(4), 10300-10315. https://doi.org/10.18697/ajfand.72.15192

Kimiywe, J., Simiyu, N. W. W., & Karuku, A. (2019). Nutrition knowledge, attitude, and practices of pregnant women in Nairobi informal settlements: A case study of Korogocho. *African Journal of Food, Agriculture, Nutrition and Development, 19*(3), 14897-14912. https://doi.org/10.18697/ajfand.85.18501

Kipkebut, L., Koech, J., & Njuguna, S. (2021). Nutritional status and dietary diversity among pregnant women in Marakwet County, Kenya. *Journal of Food and Nutrition Sciences, 9*(3), 110-116. https://doi.org/10.11648/j.jfns.20210903.11

Klassen, K. M., Douglass, C. H., Brennan, L., Truby, H., & Lim, M. S. C. (2018). Social media use for nutrition outcomes in young adults: A mixed-methods systematic review. *The International Journal of Behavioral Nutrition and Physical Activity*, 15(1), 70. https://doi.org/10.1186/s12966-018-0696-y

Koehler, K., & Drenowatz, C. (2022). Understanding the interaction between physical activity and diet for the promotion of health and fitness. *Frontiers in Nutrition*, 8, 835535. https://doi.org/10.3389/fnut.2021.835535

Korir, L., Rizov, M., & Ruto, E. (2023). Diet diversity, malnutrition and health: Evidence from Kenya. *Journal of Agricultural Economics, 74*(2), 534-550. https://doi.org/10.1111/1477-9552.12519

Kothari, M. T., Abderrahim, N., Coile, A., & Cheng, Y. (2014). Nutritional status of women and children. *Rockville, ICF International*.

Kubota, K., Itoh, H., Tasaka, M., Naito, H., Fukuoka, Y., Muramatsu Kato, K., Kohmura, Y. K., Sugihara, K., Kanayama, N., & Hamamatsu Birth Cohort (HBC) Study Team (2013). Changes of maternal dietary intake, bodyweight and fetal growth throughout pregnancy in pregnant Japanese women. *The Journal of Obstetrics and Gynaecology Research,* 39(9), 1383–1390. https://doi.org/10.1111/jog.12070

Landais, E., Miotto-Plessis, M., Bene, C., Maitre d'Hotel, E., Truong, M. T., Somé, J.W., Verger, E.O. (2023). Consumption of food away from home in low- and middle-income countries: A systematic scoping review. *Nutrition Reviews*, 81, (6),727–754, https://doi.org/10.1093/nutrit/nuac085

Lander, R. L., Hambidge, K. M., Westcott, J. E., Tejeda, G., Diba, T. S., Mastiholi, S. C., Khan, U. S., Garcés, A., Figueroa, L., Tshefu, A., Lokangaka, A., Goudar,

S. S., Somannavar, M. S., Ali, S. A., Saleem, S., McClure, E. M., Krebs, N. F., & Preconception Nutrition Trial Group, W. F. (2019). Pregnant women in four low-middle income countries have a high prevalence of inadequate dietary intakes that are improved by dietary diversity. *Nutrients, 11*(7). https://doi.org/10.3390/nu11071560

Lee, Y. J., Kim, J. Y., Lee, D. Y., Park, K. J., Kim, G. H., Kim, J. E., Roh, G. S., Lim, J. Y., Koo, S., Lim, N. K., Park, H. Y., & Kim, W. H. (2020). Alcohol consumption before pregnancy causes detrimental fetal development and maternal metabolic disorders. *Scientific Reports*, 10(1), 10054. https://doi.org/10.1038/s41598-020-66971-1

Li, S., Zhu, Y., Zeng, M., Li, Z., Zeng, H., Shi, Z., & Zhao, Y. (2022). Association between nutrition literacy and overweight/obesity of adolescents: A cross-sectional study in Chongqing, China. *Frontiers in Nutrition*, 9, 893267. https://doi.org/10.3389/fnut.2022.893267

Lindsay, K. L., Gibney, E. R., McNulty, B. A., & McAuliffe, F. M. (2017). Maternal nutrition among women from Sub-Saharan Africa, with a focus on Nigeria: A systematic review of dietary intakes. *Nutrients, 9*(5), 499. https://doi.org/10.3390/nu9050499

Liu, J., Steele, E. M., Li, Y., Karageorgou, D., Micha, R., Monteiro, C. A., & Mozaffarian, D. (2022). Consumption of ultraprocessed foods and diet quality among U.S. children and adults. *American Journal of Preventive Medicine*, 62(2), 252–264. https://doi.org/10.1016/j.amepre.2021.08.014

Lokuruka, M.N.I. (2020). Food and nutrition security in East Africa (Kenya, Uganda and Tanzania): Status, challenges and prospects. In B. Mahmoud (Ed), *Food Security in Africa*. IntechOpen. http://dx.doi.org/10.5772/intechopen.95036

Mackay, H., Omondi, S.O., Jirström, M., Alsanius, B. (2023). Analysing diet composition and food insecurity by socio-economic status in secondary African cities. In: Riley, L., Crush, J. (eds) *Transforming Urban Food Systems in Secondary Cities in Africa*. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-93072-1_10

Maina, C. C., & Kornher, L. (2024). Role of food choice motives in the socio-economic disparities in diet diversity and obesity outcomes in Kenya. *Plos ONE, 19*(5). https://doi.org/10.1371/journal.pone.0302510

Marchese, L. Livingstone, K.M, Woods, J.L., Wingrove, K., & Machado, P. (2021). Ultra-processed food consumption, socio-demographics and diet quality in Australian adults. *Public Health Nutrition*, 25(1), 94–104. https://doi.org/10.1017/S1368980021003967

Martini, D., Godos, J., Bonaccio, M., Vitaglione, P., & Grosso, G. (2021). Ultra-processed foods and nutritional dietary profile: A meta-analysis of nationally representative samples. *Nutrients*, 13(10), 3390. https://doi.org/10.3390/nu13103390

Matsumoto, M., Saito, A., Okada, C., Okada, E., Tajima, R., & Takimoto, H. (2021). Consumption of meals prepared away from home is associated with inadequacy of dietary fiber, vitamin C and mineral intake among Japanese adults: analysis from the 2015 National Health and Nutrition Survey. *Nutrition Journal*, 20(1), 40. https://doi.org/10.1186/s12937-021-00693-6

Mbijiwe, J., Kiiru, S., Konyole, S., Ndung'u, N., & Kinyuru, J. (2021). Impact of COVID-19 pandemic on food consumption pattern in the population of Nairobi. *Journal of Agriculture Science and Technology*, 20(3) 16-26. https://ojs.jkuat.ac.ke/index.php/JAGST/index

Mbogori, T., Karanja, M. N., & Muchemi, S. K. (2020). The influence of home-cooked meals on diet quality and health outcomes among pregnant women in Nairobi, Kenya. *Journal of Nutrition and Metabolism,* 2020, 8856704. https://doi.org/10.1155/2020/8856704

McCullough, M. L., Chantaprasopsuk, S., Islami, F., Rees-Punia, E., Um, C. Y., Wang, Y., Leach, C. R., Sullivan, K. R., & Patel, A. V. (2022). Association of socioeconomic and geographic factors with diet quality in US Adults. *JAMA* 5(6), e2216406. https://doi.org/10.1001/jamanetworkopen.2022.16406

McCullough, M. L., Patel, R., Kushi, L. H., Patel, A. V., Willett, W. C., & Jacobs, D. R. Jr. (2022). Diet quality and survival among men and women: A multiethnic cohort study. *American Journal of Clinical Nutrition, 116*(2), 587-598. https://doi.org/10.1093/ajcn/nqac156

McLean, E., Cogswell, M., Egli, I., Wojdyla, D., & de Benoist, B. (2009). Worldwide prevalence of anaemia, WHO Vitamin and Mineral Nutrition Information System, 1993-2005. *Public Health Nutrition*, 12(4), 444–454. https://doi.org/10.1017/S1368980008002401

Mills, S., Brown, H., Wrieden, W., White, M., & Adams, J. (2017). Frequency of eating home cooked meals and potential benefits for diet and health: cross-sectional analysis of a population-based cohort study. *The International*

Journal of Behavioral Nutrition and Physical Activity, 14(1), 109. https://doi.org/10.1186/s12966-017-0567-y

Ministry of Health (2018). Kenya National Nutrition Action Plan 2018-2022. https://scalingupnutrition.org/wp-content/uploads/2020/10/Kenya-National-Nutrition-Action-Plan-2018-22.pdf

Mitheko, A., Kimiywe, A. & Njiru, P.N. (2015). *Dietary, socio-economic and demographic factors influencing Serum Zinc levels of pregnant women At Naivasha Level 4 Hospital Nakuru County, Kenya*, presented at the 2nd International Scientific Conference, CHS And KNH, 19th - 21st June 2013. http://hdl.handle.net/11295/61123

Moafi, F., Kazemi, F., Samiei Siboni, F., & Alimoradi, Z. (2018). The relationship between food security and quality of life among pregnant women. *BMC Pregnancy and Childbirth*, 18(1), 319. https://doi.org/10.1186/s12884-018-1947-2

Morseth, M. S., Grewal, N. K., Kaasa, I. S., Hatloy, A., Barikmo, I., & Henjum, S. (2017). Dietary diversity is related to socioeconomic status among adult Saharawi refugees living in Algeria. *BMC public health, 17*(1), 621. https://doi.org/10.1186/s12889-017-4527-x

Mousa, A., Naqash, A., & Lim, S. (2019). Macronutrient and micronutrient intake during pregnancy: An overview of recent evidence. *Nutrients, 11*(2). https://doi.org/10.3390/nu11020443

Mucheru, C., Karanja, N., & Mwangi, M. (2017). Physical activity and diet quality among pregnant women in Kenya. *Journal of Physical Activity and Health, 14*(9), 732-738. https://doi.org/10.1123/jpah.2017-0013

Mumena, W. A., Ateek, A. A., Alamri, R. K., Alobaid, S. A., Alshallali, S. H., Afifi, S. Y., Aljohani, G. A., & Kutbi, H. A. (2022). Fast-Food consumption, dietary quality, and dietary intake of adolescents in Saudi Arabia. *International Journal of Environmental Research and Public Health*, 19(22), 15083. https://doi.org/10.3390/ijerph192215083

Mutuku, J. M., Mbuva, C. M., & Makokha, A. N. (2020). Dietary patterns and nutritional status of pregnant women attending Kilifi County Hospital, Kenya. *African Journal of Food, Agriculture, Nutrition and Development, 20*(3), 15894-15908. https://doi.org/10.18697/ajfand.91.18484

Mwangi, M. N., Materu, J., Ngugi, M., Mugo, M., & Mwamlole, C. (2021). Dietary diversity and micronutrient intake among pregnant women in Kitui County, Kenya. *African Journal of Food, Agriculture, Nutrition and Development, 21*(3), 17024-17038. https://doi.org/10.18697/ajfand.101.19769

Mwaniki N, Chege PM, Munyaka A (2019) Dietary diversity, iron intake and anemia among pregnant women in Embu County, Kenya. *Nutrition and Food Technology*, 5(1). http://dx.doi.org/10.16966/2470-6086.158

Nagata, J. M., Fiorella, K. J., Salmen, C. R., Hickey, M. D., Mattah, B., Magerenge, R., … Cohen, C. R. (2015). Around the table: Food insecurity, socioeconomic status, and instrumental social support among women living in a rural Kenyan Island Community. *Ecology of Food and Nutrition*, 54(4), 358–369. https://doi.org/10.1080/03670244.2014.995790

Napier, C. E., Oldewage-Theron, W., & Rutledge, S. (2019). Impact of a nutrition education programme on nutrition knowledge and dietary intake of female

caregivers in South Africa. *Health SA Gesondheid, 24*, 1297. https://doi.org/10.4102/hsag.v24i0.1297

Napier, C., Warriner, K., Sibiya, M. N., & Reddy, P. (2019). Nutritional status and dietary diversity of pregnant women in rural KwaZulu-Natal, South Africa. Health SA = SA Gesondheid, 24, 1114. https://doi.org/10.4102/hsag.v24i0.1114

Natamba, B. K., Kilama, H., Arbach, A., Achan, J., Griffiths, J. K., & Young, S. L. (2015). Reliability and validity of an individually focused food insecurity access scale for assessing inadequate access to food among pregnant Ugandan women of mixed HIV status. *Public Health Nutrition, 18*(16), 2895–2905. https://doi.org/10.1017/S1368980014001669

National Cancer Institute (NCI). (2022, 19 May). Diet history questionnaire III (DHQ III). https://epi.grants.cancer.gov/dhq3/

Njagi, P. G. (2017). *Factors that influence consumption patterns of junk foods in fast food restaurants in Nairobi City County, Kenya*. http://hdl.handle.net/11295/102203

Nutrition International. (2020). Maternal, infant, and young child nutrition in kenya: Formative research summary report. https://www.nutritionintl.org/wp-content/uploads/2021/01/ENRICH-FR-Summary-report_Kenya_FINAL_print.pdf

Obwocha, A.M., Mbagaya, G.M., & Were, G.M. (2016). Dietary intake-among pregnant women attending antenatal clinic at Kisii Level 5 Hospital, Kenya. *IOSR Journal of Environmental Science, Toxicology and Food Technology,* 10(4), 77-82. https://www.iosrjournals.org/iosr-jestft/papers/vol10-issue4/Version-1/J1004017782.pdf

Octavia, L., Agustina, R., Sartika, A. N., Utami, A. D., Dewi, Y. A., Hayuningtyas, A., Winanda, M., Prafiantini, E., & Asmarinah (2020). Associations of maternal diet quality with weight gain during pregnancy and obesity at three-year postpartum in Jakarta. *PloS ONE*, 15(12), e0244449. https://doi.org/10.1371/journal.pone.0244449

Okube, O.T., Wanjiru, M. and Andemariam, W. (2022) Magnitude and determinants of undernutrition among pregnant women attending a public hospital in Kenya. *Open Journal of Obstetrics and Gynecology*, 12, 541-561. https://doi.org/10.4236/ojog.2022.126048

Onyango, A. N., Odiwuor, W., & Otieno, P. (2020). Nutritional status and dietary practices among pregnant women in Vihiga County, Kenya. *African Journal of Health Sciences, 33*(2), 78-89. https://doi.org/10.4314/ajhs.v33i2.9

Onyango, E. O., Crush, J. S., & Owuor, S. (2023). Food insecurity and dietary deprivation: migrant households in Nairobi, Kenya. *Nutrients*, 15(5), 1215. https://doi.org/10.3390/nu15051215

Othoo, D.A., Waudo, J., & Kuria., E.N. (2014). Dietary assessment of vitamin A and iron among pregnant at Dhiwa Sub-county Hospital – Kenya. *African Journal of Food, Agriculture, Nutrition, And Development*, 14 (5), 2114-2128. https://www.ajol.info/index.php/ajfand/article/view/107906/97741

Otoo, G. E., Lartey, A., & Pérez-Rodrigo, C. (2016). Dietary practices and diet quality in pregnant women: A cross-sectional study in Ghana. *BMC Public Health, 16*(1), 1223. https://doi.org/10.1186/s12889-016-3885-3

Pancer, E., Philp, M., Poole, M., & Noseworthy, T. J. (2022). Content hungry: How the nutrition of food media influences social media engagement. *Journal of Consumer Psychology*, *32*(2), 336-349.

Park, S. Y., Shvetsov, Y. B., Kang, M., Setiawan, V. W., Wilkens, L. R., Le Marchand, L., & Boushey, C. J. (2020). Changes in diet quality over 10 years are associated with baseline sociodemographic and lifestyle factors in the multiethnic cohort study. *The Journal of Nutrition*, 150(7), 1880–1888. https://doi.org/10.1093/jn/nxaa102

Picchioni, F., Goulao, L. F., & Roberfroid, D. (2022). The impact of COVID-19 on diet quality, food security and nutrition in low- and middle-income countries: A systematic review of the evidence. *Clinical Nutrition*, 41(12), 2955–2964. https://doi.org/10.1016/j.clnu.2021.08.015

Pinto, E., Barros, H., & dos Santos Silva, I. (2009). Dietary intake and nutritional adequacy prior to conception and during pregnancy: A follow-up study in the North of Portugal. *Public Health Nutrition*, 12(7), 922–931. https://doi.org/10.1017/S1368980008003595

Rajabzadeh-Dehkordi, M., Mohammadi-Nasrabadi, F., Nouri, M., Ahmadi, A., & Faghih, S. (2023). Food insecurity, body mass index, socio-economic status, and food intake in lactating and non-lactating mothers with children under two years. *BMC Nutrition*, 9(1), 62. https://doi.org/10.1186/s40795-023-00718-9

Rolfers, K., Pinna, H., & Whitney, E. (2020). *Understanding normal and clinical nutrition*, Yolanda Cossio, Wadsworth, OH, USA.

Salam, R. A., Syed, B., Syed, S., Das, J. K., Zagre, N. M., Rayco-Solon, P., & Bhutta, Z. A. (2015). Maternal nutrition: How is Eastern and Southern Africa faring and

what needs to be done? *African Health Sciences*, 15(2), 532–545. https://doi.org/10.4314/ahs.v15i2.28

Sankavaram, K., Roe, A. J., Whiteley, J., & Price, W. J. (2022). Diet quality and nutrition behavior of federal nutrition education program participants before and during the COVID-19 pandemic. *Nutrients*, 15(1), 141. https://doi.org/10.3390/nu15010141

Shamim, A. A., Mashreky, S. R., Ferdous, T., Tegenfeldt, K., Roy, S., Rahman, A. K. M. F., Rashid, I., Haque, R., Rahman, Z., Hossen, K., Siddiquee, S. R., Rahman, M., Sanghvi, T. G., & Shaheen, N. (2016). Pregnant women diet quality and its sociodemographic determinants in Southwestern Bangladesh. *Food and Nutrition Bulletin,* 37(1), 14–26. https://doi.org/10.1177/0379572116632137

Shin, D., Bianchi, L., Chung, H., Weatherspoon, L., & Song, W. O. (2014). Is gestational weight gain associated with diet quality during pregnancy? Maternal and child health journal, 18(6), 1433–1443. https://doi.org/10.1007/s10995-013-1383-x

Singh, D. R., Ghimire, S., Upadhayay, S. R., Singh, S., & Ghimire, U. (2020). Food insecurity and dietary diversity among lactating mothers in the urban municipality in the mountains of Nepal. *PloS ONE*, 15(1), e0227873. https://doi.org/10.1371/journal.pone.0227873

Solymári, D., Kairu, E., Czirják, R., & Tarrósy, I. (2022). The impact of COVID-19 on the livelihoods of Kenyan slum dwellers and the need for an integrated policy approach. *PloS ONE*, 17(8), e0271196. https://doi.org/10.1371/journal.pone.0271196

Soma-Pillay, P., Nelson-Piercy, C., Tolppanen, H., & Mebazaa, A. (2016). Physiological changes in pregnancy. *Cardiovascular Journal of Africa*, 27(2), 89–94. https://doi.org/10.5830/CVJA-2016-021

Saaka, M. (2012). Maternal dietary diversity and infant outcome of pregnant women in Northern Ghana. *International Journal of Child Health and Nutrition*, *1*(2), 148-156.

Taylor, M. K., Sullivan, D. K., Ellerbeck, E. F., Gajewski, B. J., & Gibbs, H. D. (2019). Nutrition literacy predicts adherence to healthy/unhealthy diet patterns in adults with a nutrition-related chronic condition. *Public Health Nutrition*, 22(12), 2157–2169. https://doi.org/10.1017/S1368980019001289

Teweldemedhin, L. G., Amanuel, H. G., Berhe, S. A., Gebreyohans, G., Tsige, Z., & Habte, E. (2021). Effect of nutrition education by health professionals on pregnancy-specific nutrition knowledge and healthy dietary practice among pregnant women in Asmara, Eritrea: A quasi-experimental study. *BMJ Nutrition, Prevention & Health*, 4(1), 181–194. https://doi.org/10.1136/bmjnph-2020-000159

The United Nations System Standing Committee on Nutrition. (2017). Maternal Nutrition and the Intergenerational Cycle of Growth Failure, pp. 62–75, The United Nations System Standing Committee on Nutrition, 2017.

Thorpe, M. G., Milte, C. M., Crawford, D., & McNaughton, S. A. (2019). Education and lifestyle predict change in dietary patterns and diet quality of adults 55 years and over. *Nutrition Journal*, 18(1), 67. https://doi.org/10.1186/s12937-019-0495-6

United Nations Children's Fund (UNICEF). Undernourished and Overlooked: A Global Nutrition Crisis in Adolescent Girls and Women. UNICEF Child Nutrition Report Series, 2022. UNICEF, New York, 2023. https://www.unicef.org/reports/undernourished-overlooked-nutrition-crisis

Van den Berg, V.L., Jordaan, E.M., Robb, L., Ngounda, J., Nel, M., Walsh, C.M. (2022). Cross sectional analysis of dietary quality among pregnant women in central South Africa: The NuEMI study. *Research Square*, https://doi.org/10.21203/rs.3.rs-1777505/v1

Velpini, B., Vaccaro, G., Vettori, V., Lorini, C., & Bonaccorsi, G. (2022). What is the impact of nutrition literacy interventions on children's food habits and nutrition security? A scoping review of the literature. *International Journal of Environmental Research and Public Health*, 19(7), 3839. https://doi.org/10.3390/ijerph19073839

Victora, C. G., Adair, L., Fall, C., Hallal, P. C., Martorell, R., Richter, L., & Sachdev, H. S. (2008). Maternal and child undernutrition: consequences for adult health and human capital. *The Lancet*, *371*(9609), 340-357.

Vilar-Compte, M., Burrola-Méndez, S., Lozano-Marrufo, A., Ferré-Eguiluz, I., Flores, D., Gaitán-Rossi, P., Teruel, G., & Pérez-Escamilla, R. (2021). Urban poverty and nutrition challenges associated with accessibility to a healthy diet: A global systematic literature review. *International Journal for Equity in Health*, 20(1), 40. https://doi.org/10.1186/s12939-020-01330-0

Vila-Real, C. P. M., Pimenta-Martins, A. S., Kunyanga, C. N., Mbugua, S. K., Katina, K., Maina, N. H., Gomes, A. M. P., & Pinto, E. C. B. (2022). Nutritional intake

and food sources in an adult urban Kenyan population. *Nutrition Bulletin*, 47(4), 423–437. https://doi.org/10.1111/nbu.12582

Wafula, E., Mwangi, A., & Karanja, N. (2019). Nutritional status and dietary diversity among pregnant women in Kakamega County, Kenya. *Journal of Food and Nutrition Sciences, 7*(2), 42-48. https://doi.org/10.11648/j.jfns.20190702.13

Wanjiru, P., Mutuku, J., & Mwaniki, D. (2018). Socioeconomic determinants of dietary diversity and nutritional status among pregnant women in Nakuru County, Kenya. *African Journal of Food, Agriculture, Nutrition and Development, 18*(2), 13348-13360. https://doi.org/10.18697/ajfand.82.17202

Wanjohi, M., Onyango, A., & Makokha, A. (2020). Dietary diversity and its determinants among pregnant women in Nairobi's informal settlements. *African Journal of Food, Agriculture, Nutrition and Development, 20*(4), 16534-16549. https://doi.org/10.18697/ajfand.95.18528.

Wanyama, R., Gödecke, T. & Qaim, M. (2019). Food security and dietary quality in African slums. sustainability, 11(21), 5999. http://dx.doi.org/10.3390/su11215999

Watanabe, D., Murakami, H., Gando, Y., Kawakami, R., Tanisawa, K., Ohno, H., Konishi, K., Sasaki, A., Morishita, A., Miyatake, N., & Miyachi, M. (2022). Association between temporal changes in diet quality and concurrent changes in dietary intake, body mass index, and physical activity among Japanese adults: A Longitudinal study. *Frontiers in Nutrition*, 9, 753127. https://doi.org/10.3389/fnut.2022.753127

Wheeler, M. L., Daly, A., Evert, A., Franz, M. J., Geil, P., Holzmeister, L. A., ... & Woolf, P. (2008). Choose your foods: Exchange lists for diabetes, 2008:

description and guidelines for use. *Journal of the American Dietetic Association*, *108*(5), 883-888. http://dx.doi.org/10.1016/j.jada.2008.02.002

WHO (2020). The WHO STEPwise approach to chronic disease risk factor surveillance (STEPS): Standard Steps Instrument. https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/steps/instrument

WHO. (2018). *WHO recommendations on antenatal care for a positive pregnancy experience*. WHO: Geneva, Switzerland.

Wolfson, J. A., Leung, C. W., & Richardson, C. R. (2020). More frequent cooking at home is associated with higher Healthy Eating Index-2015 score. *Public Health Nutrition, 23*(13), 2384–2394. https://doi.org/10.1017/S1368980019003549

World Bank. (nd.). Total alcohol consumption per capita, female (liters of pure alcohol, projected estimates, female 15+ years of age) – Kenya. https://data.worldbank.org/indicator/SH.ALC.PCAP.FE.LI?locations=KE

Zasimova L. (2022). The association between fast-food consumption and job-related factors among Russian adults. *Economics and Human Biology*, 46, 101147. https://doi.org/10.1016/j.ehb.2022.101147

APPENDICES

Appendix 1: QUESTIONNAIRES

Diet Quality.

24-hour Recall

TIME	FOOD DESCRIPTION	SOURCE				INGREDIENTS	PORTION SIZE
		Home	Resta	Schoo l/	Other		

MATERNAL CHARACTERISTICS

SECTION I: Socio-demographic factors

1. How old are you?.....

2. Marital Status

   a. Single ( )

   b. Married ( )

   c. Divorced ( )

   d. Widowed ( )

3. Level of Education

   a. Primary ( )

   b. Secondary ( )

   c. Tertiary ( )

   d. None ( )

4. Employment status

a. Self-employed ( )

b. Government/private employed ( )

c. Housewife ( )

5. Your current pregnancy, is pregnancy number ..... ?

6. Currently your pregnancy is how many months… ..... ?

7. How many times have you attended ANC during this pregnancy .....?

8. Do you receive any services during the ANC visit?

a. Yes ( )

b. No ( )

If yes, which one

a) Nutrition services ( )

b) Others ( )

SECTION B: Food security.
In the last four weeks…….

Food security Question	**NO**	**YES(specify the frquency)**	**Frequency**
Were you or any member of your household Worried that your household would not have enough food?			Often (more than10 times)
			Sometimes (3-10 times)
			Rarely (1-times)
Were you or any member of your household Unable to eat the kinds of foods you preferred because of a lack of resources?			Often (more than10 times)
			Sometimes (3-10 times)
			Rarely (1-times)
Did You or any member of your household Had to eat a limited variety of foods due to a lack of resources?			Often (more than10 times)
			Sometimes (3-10 times)
			Rarely (1-times)
Were you or any member of your household had to eat some foods that you did not want to eat because of lack of resources to obtain other types?			Often (more than10 times)
			Sometimes (3-10 times)
			Rarely (1-times)
			Often (more than10 times)

Did You or any member of your household had to eat a smaller meal than you felt you needed because there was not enough food?			Sometimes (3-10 times)
			Rarely (1-times)
Did You or any member of your household had to eat fewer meals in a day because there was not enough food?			Often (more than10 times)
			Sometimes (3-10 times)
			Rarely (1-times)
Was there an occurrence when there was no food to eat of any kind in your household because of a lack of resources to get food?			Often (more than10 times)
			Sometimes (3-10 times)
			Rarely (1-times)
Did You or any member of your household Went to sleep at night hungry because there was not enough food?			Often (more than10 times)
			Sometimes (3-10 times)
			Rarely (1-times)
Did You or any member of your household Went a whole day and night without eating anything because there was not enough food?			Often (more than10 times)
			Sometimes (3-10 times)
			Rarely (1-times)

Lifestyle

10. International physical activity questionnaire. IPAQ

In the last 7 days, think for like 5 minutes of the activities you did that involved a lot of energy and help answer the next set of questions.

1. In these last 7 days, how many days did you do activities such as aerobics, fast bicycle cycle, digging or heavy lifting? _____if no, skip to Question 3.

2. If you answered question 1 above, how much time did you spend?

a. Hours per day ( )

b. Minutes per day ( )

c. Don't know/Not sure ( )

In the last 7 days, think for like 5 minutes of the activities you did that involved a moderate energy and help answer the next set of questions

3. In the last 7 days, how many days did you do activities such as cycling at regular pace, light loads, double tennis? _____ f no, skip to Question 5

4. If you answered question 3 above, how much time did you spend?

a. Hours per day ( )

b. Minutes per day ( )

c. Don't know/Not sure ( )

In the last 7 days, think for like 5 minutes of the activities you did solely for leisure, recreation or exercise or walking to travel from place to place.

5. In the last 7 days, how many days did you do such activities? _____if no, skip to Question 7.

6. If you answered question 5 above, how much time did you spend?

a. Hours per day ( )

b. Minutes per day ( )

c. Don't know/Not sure ( )

How much time in the last 7 days did you send siting (include the time at work, home or leisure)-riding, watching television, visiting friends.

7. In the last 7 days, how many days did you do such activities? _____

8. If you answered question 7 above, how much time did you spend?

a. Hours per day ( )

b. Minutes per day ( )

c. Don't know/Not sure ( )

11. Do you drink alcohol?

a) Yes ( )

b) No ( )

If yes, how many times per week?

_____

12. Out of 7 days in a week, how many times do you eat home-made food? _____

14. How often do you eat fast food? _____

OBJECTIVE 3

Nutrition Literacy;

Subscale I. Nutrition and Health

1. Which food do you consumed most often?

A. Regular soda ☐ B. French fries ☐ C. an orange ☐ D. apple juice ☐

2. Which food should be consumed with moderation?

A. Beans ☐ B. Cabbage ☐ C. Fried Chicken☐ D. French fries ☐

3. Which ultra-processed foods should you avoid in the diet

A. Fresh fruit juice ☐ B. Sausages ☐ C. Rice ☐ D. Soda ☐

Subscale II. Energy Sources in Food

1. Vegetable oil and butter (such as Blue Band) have high _____content ☐

A. Vitamin E B. Carbohydrate C. Protein D. fat

2. Meat and dry beans have high _____content ☐

A. Iron B. carbohydrate C. protein D. fat

3. Rice and maize meal have high _____content ☐

A. Vitamin A B. Carbohydrate C. Protein D. fat

Subscale II. Food Groups

1. Rice belongs to which food group? ☐

A. Grains B. Vegetables C. Fruits D. Protein E. Fats and oils F. Added sugars

2. Milk belongs to which food group? ☐

A. Grains B. Vegetables C. Fruits D. Dairy E. Fats and oils F. Added sugars

3. Margarine belongs to which food group ☐

A. Grains B. Vegetables C. Fruits D. Protein E. Fats and oils F. Added sugars

Subscale VI. Consumer Skills

1. Which food provides the most healthful nutrients overall? ☐

A. Orange juice with no sugar added

B. An orange with added sugar

C. Orange juice with no sugar added is equal to an orange in nutrition

2. Which food provides the most healthful nutrients overall? ☐

A. Stewed beef

B. Fried beef

C. There is no difference in nutrition content of the two foods

3. Which food is healthier? ☐

A. Canned tomato paste

B. Fresh tomatoes

C. There is no difference in nutrition content of the two foods

Appendix 2: PARTICIPANT INFORMATION AND CONSENT FORM

Title of Study:

DETERMINANTS OF DIET QUALITY AMONG PREGNANT MOTHERS ATTENDING ANTENATAL CARE AT ST. MARYS MISSION HOSPITAL, NAIROBI COUNTY

Principal Investigator\and institutional affiliation:

Mercy Nyangaresi, Amref International University

Co-Investigators and institutional affiliation:

Prof Anselimo Makokha and Dr. Florence Kyallo of Jomo Kenyatta University of Science and Technology.

Introduction:

I would like to tell you about a study being conducted by the above listed researchers. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called 'informed consent'. Once you understand and agree to be in the study, I will request you to sign your name on this form.

You should understand the general principles which apply to all participants in medical research:

i. Your decision to participate is entirely voluntary

ii. You may withdraw from the study at any time without necessarily giving a reason for your withdrawal

iii. Refusal to participate in the research will not affect the services you are entitled to in this health facility or other facilities. We will give you a copy of this form for your records.

May I continue? YES NO☐ ☐

This study has approval by The AMREF Ethics and scientific review committee.

Research Committee Protocol No. P1340-2022

WHAT IS THIS STUDY ABOUT?

The researchers listed above are interviewing individuals who seeking antenatal care at St. Mary's Mission Hospital. The purpose of the interview is to find out the determinants of diet quality among pregnant mothers attending antenatal care at St. Mary's Mission Hospital. Participants in this research study will be asked questions about determinants of diet quality, maternal characteristics of ANC mothers, level of nutrition literacy.

There will be approximately 200 in this study randomly chosen. We are asking for your consent to consider participating in this study.

WHAT WILL HAPPEN IF YOU DECIDE TO BE IN THIS RESEARCH STUDY?

If you agree to participate in this study, the following things will happen:

A trained interviewer in a private area where you feel comfortable answering questions will interview you. The interview will last approximately 20 minutes. The interview will cover topics such as determinants of diet quality, maternal characteristics of ANC mothers, level of nutrition literacy.

.

ARE THERE ANY RISKS, HARMS DISCOMFORTS ASSOCIATED WITH THIS STUDY?

Medical research has the potential to introduce psychological, social, emotional and physical risks.

Effort should always be put in place to minimize the risks. One potential risk of being in the study is loss of privacy. We will keep everything you tell us as confidential as possible. We will use a code number to identify you in a password-protected computer database and will keep all of our paper records in a locked file cabinet. However, no system of protecting your confidentiality can be secure, so it is still possible that someone could find out you were in this study and could find out information about you.

In addition, answering questions in the interview may be uncomfortable for you. If there are any questions you do not want to answer, you can skip them. You have the right to refuse the interview or any questions asked during the interview.

ARE THERE ANY BENEFITS BEING IN THIS STUDY?

There will be no direct benefit in participating in this interview, however if you have any question the investigator will readily assist you. In addition, the information you provide will help us better understand the determinants of diet quality among pregnant mothers. This information is a contribution to science and inform on policy formulations.

WILL BEING IN THIS STUDY COST YOU ANYTHING?

You will not be charged any money to participate in this study

WILL YOU GET REFUND FOR ANY MONEY SPENT AS PART OF THIS STUDY?

The researchers do not foresee any event that will have financial implication on the research participant. We however commit ourselves to refund any cost justifiably incurred by the participant because of this study. We will however not compensate anything outside the scope of this study and non-recruited persons.

WHAT IF YOU HAVE QUESTIONS IN FUTURE?

If you have further questions or concerns about participating in this study, please call or send a text message to the (0720419580)

If you have any comments concerning your rights as study participants, please call or write a text to

Amref Ethical and Scientific Review Committee (ESRC), Lang'ata Road, opposite Wilson Airport

P.O Box 27691 – 00506, Nairobi, Kenya

Esrc.Kenya@amref.org Tel: +254 795 746 777

In course of this study, the study staff will pay you back for your charges to these numbers if the call is for study-related communication.

WHAT ARE YOUR OTHER CHOICES?

Your decision to participate in research is voluntary. You are free to decline participation in the study and you can withdraw from the study at any time without injustice or loss of any benefits, and decide if the data that you already submitted will be included in the study or not.

CONSENT FORM (STATEMENT OF CONSENT)

Participant's statement

I have read this consent form or had the information read to me. I have had the chance to discuss this research study with a study counsellor. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.

I understand that all efforts will be made to keep information regarding my personal identity confidential.

By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study. I consent voluntarily to participate in this interview.

Participant printed name:

_____

Participant signature / Thumb stamp _____ Date _____

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher's Name: _____ Date: _____

Signature_____

Appendix 3: LETTER OF APROVAL FOR THE STUDY AREA

St. Mary's MISSION HOSPITAL
Compassion in Healthcare

Nairobi
P. O. Box 960 – 00517 Nairobi
Tel: 0797972794, +254 207851300, 0796781880.
Email: info@stmmh.co.ke

Rift Valley
P. O. Box 224-20116 Gilgil
Tel: +254 0717305089
Email: elementaita@stmmh.co.ke

Date: 11/03/2024

Dear Ms. Nyangaresi,

RE: Permission Granted for Study on Determinants of Diet Quality Among Pregnant Mothers Attending Antenatal Care at St. Mary's Mission Hospital, Lang'ata Sub-county

I am writing to inform you that we have reviewed your request to conduct a study on the determinants of diet quality among pregnant mothers attending antenatal care at St. Mary's Mission Hospital, Lang'ata Sub-county. After careful consideration, we are pleased to grant you permission to proceed with your study.

We appreciate your commitment to advancing knowledge in public health and recognize the significance of your research in improving maternal and child health outcomes. You have our full support in conducting your study, and we trust that your findings will enhance our understanding of diet quality among pregnant women. It is imperative that all aspects of your study adhere to the highest standards of professionalism and integrity, ensuring confidentiality and the well-being of participants. We eagerly anticipate receiving feedback on the study outcomes and collaborating with you to implement any relevant recommendations. Should you require further assistance or support, please do not hesitate to reach out to us. We are prepared to provide resources and facilitate access to participants as needed.

Once again, thank you for choosing St. Mary's Mission Hospital as the site for your research study. We wish you success in your endeavours and commend your dedication to making meaningful contributions to public health research.

Best regards
Dr. Opuba
Medical superintendent
St. Mary's Mission Hospital.

ST. MARY'S MISSION HOSPITAL
LANGATA
Compassion in Healthcare
11 MAR 2024
P. O. Box 960 - 00517, NAIROBI
Tel: 020-7851300, 0777-305 204

Appendix 4: NACOSTI Research Licence

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **963260**

Date of Issue: **01/March/2023**

RESEARCH LICENSE

This is to Certify that Ms.. Mercy Mosoti Nyangaresi of Amref International University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: DETERMINANTS OF DIET QUALITY AMONG PREGNANT MOTHERS ATTENDING ANTENATAL CARE AT ST MARYS MISSION HOSPITAL, NAIROBI COUNTY, KENYA. for the period ending : 01/March/2024.

License No: **NACOSTI/P/23/23395**

963260

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

Appendix 5: ESRC APPROVAL LETTER

amref health africa

Amref Health Africa in Kenya

REF: AMREF – ESRC P1340/2022 **January 24, 2023**

Mercy Nyangaresi
Amref International University
P.O Box 27691-00506
Nairobi, Kenya
Tel: +254 720419580
Email: mercynyangaresi@gmail.com

Dear Mercy Nyangaresi,

RESEARCH PROTOCOL: DETERMINANTS OF DIET QUALITY AMONG PREGNANT MOTHERS ATTENDING ANTENATAL CARE AT ST. MARY'S MISSION HOSPITAL NAIROBI COUNTY

Thank you for submitting your protocol to the Amref Ethics and Scientific Review Committee (ESRC).

This is to inform you that the ESRC has reviewed and approved your protocol. Your application approval number is ESRC P1340/2022. The approval period is from January 24, 2023, to January 23, 2024, and is subject to compliance with the following requirements:

a) Only approved documents (including informed consents, study instruments, advertising materials, material transfer agreements, etc.) will be used.
b) All changes including (amendments, deviations, violations, etc.) are submitted for review and approval by Amref ESRC before implementation.
c) Death and life-threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the Amref ESRC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to Amref ESRC within 72 hours.
e) Clearance for export of biological specimen must be obtained from the relevant government authorities for each batch of shipment/export.
f) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval

amref health africa

Amref Health Africa in Kenya

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

Please do not hesitate to contact the ESRC Secretariat (esrc.kenya@amref.org) for any clarification or query.

Yours sincerely,

AMREF - ESRC
24 JAN 2023
P.O. Box 30125 - 00100, NAIROBI

Prof. Mohamed Karimi
Chair, Amref ESRC
CC: Samuel Muhula, Monitoring & Evaluation and Research Manager, Amref Health Africa in Kenya.

Appendix 6: PLAGIARISM REPORT

plagiarism june.docx

ORIGINALITY REPORT

10%	8%	6%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	assets.researchsquare.com Internet Source	1%
2	bmcpregnancychildbirth.biomedcentral.com Internet Source	1%
3	"IUNS. 21st International Congress of Nutrition. Buenos Aires, Argentina, October 15-20, 2017: Abstracts", Annals of Nutrition and Metabolism, 2017 Publication	<1%
4	scholars.wlu.ca Internet Source	<1%
5	erepository.uonbi.ac.ke Internet Source	<1%
6	Submitted to Mount Kenya University Student Paper	<1%
7	www.repository.cam.ac.uk Internet Source	<1%